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UNITED NATIONS CONFERENCE
ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

Agenda Item: C.7.2

Romania

TECHNICAL AND SCIENTIFIC METHODS IN FORESTRY

By Eng. N. CELAC,
Adviser in the State Committee
for Planning

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TECHNICAL AND SCIENTIFIC METHODS IN FORESTRY

By
Eng. N.Celac, Adviser in the State Committee
for Planning

1. The usefulness of discussions concerning the scientific and technical methods applied in forestry is accounted for by the importance of forests in the economic development of most countries. Being one of the main natural resources, the forests represent not only an important source of raw materials (woody and other products) which can be processed in many industrial branches, but also play an important hydrological, anti-erosional and sanitary-esthetic role, contributing to the hydroenergetic potential and irrigation of water bodies, to efficiently enhancing the value of light erosionable areas, to improving the sanitary standard of industrial and urban centers as well as to the beauty of landscapes. Being on the whole a public ownership, the forests imply a careful management in accordance with the national economy requirements of the developing countries.

2. Starting from the fact that woody area management in accordance with the technical and scientific requirements represents a main element for the preservation and economical exploitation of this natural resource, we intend to present here some aspects of the methods of solving this problem, used in the Rumanian People's Republic. We must however specify that this experience is closely related, on the one hand, to the natural specific conditions in our country and, on the other, to the fact that our economy is a socialist and a planned one, offering the most favourable conditions for solving the problems raised by the scientific and technical methods used in forestry, within the general plan of national economy development.

3. On account of her geographical position [a] and oropedoclimatic conditions [b] the Rumanian People's Republic has a woody area with numerous species and valuable timber. The cover of spontaneous vegetation shows altitudinally and partly latitudinally a large range of forest phytocenoses, beginning with those specific to the warm forest steppe up to those which bound the alpine meadows.

4. In the territories of the warm forest steppe the stands are com-

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[a] Geographic position: between about 43°-48° northern latitude and about 2o°-29° eastern longitude.

[b] Oropedoclimatic conditions; a central mountain square (up to 25oo m. altitude), having an inner plateau and hills and exterior plains. Temperate-continental climate, with altitudinally varying temperatures between 11.6 and -2.6° and precipitations of about 3oo-15oo mm (mean annual values). The soil types vary from chernozems, boggy soils and sands in the plain to alpine meadow soils.

9. In our country the forest management on a sylvicultural basis has started in the first half of last century. Howeverm until the end of the second world war an irrational system of forest management was carried out, with tremendous damages for the national economy. A proper policy of managing the forest fund has begun to be fulfilled only after the establishment of people's power, when all the forests have become a social wealth (1948) and best conditions have been created for their managament on a scientific basis, corresponding to the requirements of our fast developing national economy.

10. The necessity of knowing as much as possible the extension, structure and productivity of our present forests, on the one hand, and the breeding and harvesting methods which ensure a constant increase of the productivity of the forest patrimony, on the other hand, has imposed a coordinated development of some very important technical and scientific studies.

11. In order to know our national wooded area , managements have been carried out in a unitary system in the period 1948-1955 (an annual average of 800,000 ha), followed by revisions of 10 year cycles. This work of big proportions required large and various scientific researches. In order to map the woody vegetation, the natural types of forests were investigated, identified and classified, drafting the types for the corresponding determination (242 types). In order to know the structure, size, growth and quality of stand growing stock, inventory methods based on researches and general volume tables (for 16 main species), sorting tables (for 12 species) and yield tables (for 13 species) for the even-aged stands were worked out, while for the uneven-aged stands only volume tables (for 3 species) and quality class tables (for 3 species) were drawn up. For the land organization of the production process, a sub-division of forests by large forest units was established while for the time-based organization -with continuity- of the same process, management methods for the regular high forest, high selection and coppices were drawn up.

12. The management of forests is carried out by a special Design Institute, and the research work is done by the Forest Research Institute. All these results represent the scientific bases of forest management.

13. a) In order to understand these problems it is necessary to specifiy that after the second world war, the new regime established in our country has inherited large areas of non-regenerated forests with stands cut at random and understocked. Since 1950, about 60,000 to 80,000 ha have been reforested yearly as compared with 30,000 ha of annual felling areas intended to be artificially regenerated.

b) By this sustained action of reforestation, a level of 94 per cent of the whole wooded area was reached by 1960.

14. This action had also to be based on scientific researches. Firstly, and due to the higly varied oropedophytoclimatic situation, the conditions for using seeds from other regions had to be set up in order to obtain sound stands of high productivity. As a result of the investigations made a new redistribution of the foresting material all over the country was elaborated. For ensuring the use of the best quality seeds and of valuable ecotypes only limits have been set up for seed reservations and conditions have been imposed that, before being used in nurseries or for direct sowing, each lot of seed must be provided with an analysis report, while in case of transfer it should be accompanied by an origin certificate. The analyses are made in five regional laboratories of the Forest Research Institute, according to the provisions of a State Standard.

posed of species of Quercus (pubescens, pedunculiflora and robur).

5. Within the forest area, the componence of woody vegetation varies according to relief zones as follow :

a) in the plain area we find pure or mixed stands of Quercus species (cerris, frainetto, robur) with other species of valuable hardwoods as : Tilia tomentosa, Fraxinus excelsior, Carpinus betelus, Ulmus campestris Acer sp. and others, as well as the natural riparian forests along the rivers and the Danubian banks, with Salix Alba and Populus;

b) in the hilly area the forests consist, in most cases, of Fagus silvatica and Q. sessilis, while in the warmer western areas of Q.cerris and frainetto and in a lower proportion of a mixture of these species with other hardwood species;

c) in the mountain area the structure of forests varies according to altitudine beginning with stands of Fagus silvatica, which reach an altitude of 1400 m above sea level and continuing with transition stands of pure Abies alba or mixed with Fagus and Picea. Then follow the pure stands of Picea, reaching an altitude of 1860 m above sea level.

6. Taken on the whole, the forests consist of the following species according to the areas occupied by the main species: 24.1 per cent of softwoods (Picea + Abies); 34,3 per cent of beech; 20.1 per cent of Quercus species and 21.5 per cent of other species. The extension of forests according to relief areas varies considerably: in the mountain regions (altitudes of about 700 m above sea level) about 54 per cent, in the hilly regions (altitudes of about 150-700 m above sea level) about 22 per cent and in the plain area (altitudes of about 150 m. above sea level) about 8 per cent. Thus, about 85 per cent of the total wooded surfaces of our country are situated in the mountain area, which has defined the orientation of the territorial organization of the activity regarding harvesting and industrial processing of wood in this area.

7. In oropedoclimatic conditions, particularly favourable to the forest vegetation, some valuable ecotypes of high productivity and quality of wood have resulted. There are regions frequently covered by natural uneven-aged stands of fir, with individuals of over 100 cm breast height diameters and heights of over 50 m, containing between 900 - 1300 cubic meters per ha (Viforîta-Penteleu, Piatra Arsă-Sinaia and others). There are also even-aged stands of fir which at an age of 95 years have a basal area at breast height of about 70 sq.m. and a corresponding volume of about 1000 cu.m. (Poiana Tapului-Valea Prahovei). In the northern regions of the country there are plantations of spruce which at an age of 50-60 years reach an average height of over 35 m (Valea Bîrgăului, and so on). From the dimensional point of view, these stands exceed by far the first class of productivity of Central and Western Europe. In the northern regions of the country, we also find the largest forests of sounding-wood spruce in Europe (Moldoviţa, Valea Putnei, etc.) which have been known for about one century on the world market for the exceptionally high quality of the wood. In other regions we find ecotypes of particularly valuable oak (Quercus sessiliflora), some of European renown (Ronişoara), the wood of which possesses physical and mechanical proprieties superior to those known in the foreign technical literature.

8. All these stands with the above mentioned ecotypes are protected and looked after, some of them constituting scientific or seed reservations. The seed production exceeds the country's needs leaving large quantities to be exported to the interested countries.

15. The work in nurseries follows rules set-up by researches,regarding : pedoclimatic and agro-techinal conditions, density of sowings,tending methods and control of forest damaging factors, conditions for skidding and classification of seedlings by quality (according to a State Standard) as well as the mechanization of works. In some nurseries the mechanization has reached a level of 85 per cent which resulted in a considerable reduction of expenses.

16. a) Reforestation is preceded by a site mapping carried out by the Forest Design Institute. As a result of researches both compulsory formulae and schemes for reforestation per site units and the way of organizing the work-yards have been established. In order to increase forests productivity in our country great attention is paid to the acclimation of exotic species and to the introduction of the most productive ones in forest cultures. The Experimetal Stations of the Forest Research Institute have dendrological gardens where hundreds of exotic species are cultivated some of which were earlier or later introduced in our forest cultures. Among these we mention the following :

b) Robinia pseudaccacia proved to be a high productive species on our fluvial and continental moving sands. At present,over 6o,ooo hectares of these lands are covered by locust forests which at an age of 3o years yield between 118 cu.m. (5th quality class) and 514 cu.m.(1st quality class) per hectare and an average of about 3oo cu.m. of which up to 75% is processing timber. Wide regions of mobile sands have thus been reclaimed. The locust wood with its characteristics similar to oak, is used in mines,for telephone poles, building timber,etc.

c) Euramerican poplars known in our country for about 5o years, have been grown on large areas only after 195o. At present, about 3o,ooo ha along the river and Danube banks are planted with these hybrids and by 1965 their extension will reach an area of over 5o,ooo ha. ensuring an annual yield of about 1,ooo,ooo cu.m. In the past frequent plantations were cultivated on a 2x2 m basis in order to obtain raw material for pulp,particle - and fibreboard industries. The productivity of the existing stands is impressive. The average annual growth at the age of 2o years varies between 3o cu.m.(1st quality class) and 8.5 cu.m.(5th quality class) with an average of 18 cu.m. There are frequent cases when the above mentioned maximum growth is exceeded. Thus, a stand situated at an altitude of 6oo m (Albeşti-Argeş) planted on the 2x2 m basis, presents at the age of 12 years a mean breast height diameter of 18.8 cm, an average height of 24.8 m, a total volume of 39o cu.m. per ha and an annual average growth of 32.5 cu.m.

d) Researches carried out by the Experimental Station for Poplars of the Forest Research Institute have established the existence,in our country, of the following poplar hybrids : "serotina", "marilandica", "regenerata", "rubusta","generosa" . At this station selection and multiplication of both native and exotic valuable hybrids are carried out as well as researches concerning the cultures in nurseries. From the native ones the following were selected :

i) Populus "serotina" - Brăila, clones R_1, R_3 and R_4

ii) Populus "robusta" - Hîrşova, clones R_{13}, R_{16}, R_{18} and R_{2o}

iii) Populus "Robusta" - Oltenița

iv) Populus "regenerata" - Celei

v) Populus "grandis" - Argeş

e) All these clones, introduced in forest plantations during the last few years, are perfectly adapted to the climatic conditions specific to plantation regions in the Rumanian People's Republic; they resist to floods for 15o to 18o days and yield wood of a high quality suitable for peeling, having fibres of average length (fron 1,ooo to 1,5oo microns) and a cellulose content from 51 to 53 per cent. From 1961 onwards, in all our nurseries only mother plants derived from the cuttings of the hybrids selected and produced by the Poplar Station are cultivated.

f) Pseudotsuga menziesi has been introduced in plantations as clumps, hursts or small stands, beginning from an altitude of 7o m up to 1,43o m. It is growing very well in the western half of the country,in the hilly regions (35o to 75o m altitude) of a continental mild climate. It has an average annual growth between 14 and 19 cu.m. per hectare,exceeding by 5o to 1oo per cent the productivity of our native species which it is mixed with. The wood is suitable for building timber, furniture, plywood, particle-and fibreboards, pulp and paper.

g) Pinus strobus is occuring in stands at altitudes varying between 8o m and 97o m. The best results have been obtained at altitudes from 25o to 6oo m, with rainfalls of at least 6oo mm. At the age of 5o to 6o years the average annual growth is of 12 to 16 cu.m.per hectare,exceeding by 4o to 8o per cent the growth of the associated species. The wood is suitable for building timber, carpentry, furniture and particle and fibreboards.

17. The existence in our country of wide regions with a draughty climate has given the opportunity to establish the most suitable sorts of wood species and the adequate techniques of afforestation. As for the afforestation of the steppe regions with degraded chernozems the best results were obtained by sowing in grouped nests Quercus pedunculiflora, cerris and borealis, mixed with Acer pseudoplatanus, Robinia pseudaccacia and Caragana arborescens. At the age of 1o years important harvests of wood were obtained by the extraction of locust trees with 8 to 18 cm. breast height diameter and 12 m height. After another 3 years the shoots of these species attained the same height as the other species (7-8 m). These stands are growing rapidly and produce wood even in the early age.

18. Experimental plantations as shelterbelts, intended to protect agricultural and forest cultures, urban and industrial centers against the severe climate and the roads against the deposits of snow, have contributed to develop both the formulae and schemes of afforestation and the instalment conditions and mechanical tending.

19. a) The great variety of forest types in the Rumanian People's Republic and the rapid transition from primary forests to second growth has raised various and complex problems for our forest management as concerns the control of animal and vegetal pests. The rather frequent bulkywindfalls of spruce have imposed important protective work to be carried out as well as the control of Ipidae. The apparition of the attacks with Lymantria dispar on oak and with Lymantria monacha on spruce has given the opportunity for developping a large research and control work. Special attention was given to the developping of an efficient warning and foresight system.

b) The minimum density of the insects L.monacha, L.dispar and Tortrix viridana - producing mass-leaf dropping - was established by research work, while for preventing their evolution and fecundation phases, the dynamics of sex-ratio, the weight of pupes, the number of deposited eggs, the percentage of parasits, etc.,were established. On this basis special prescriptions were drwn-up for some elements of prognosis as well as the

rules for the minimum sanitary measures for various types of forests.

2o. Simultaneously with the measures intended to identify the attacks, measures were taken for establishing - on a scientific research basis -the control techniques and the most efficient insecticides, helping our chimical industry to manufacture a series of products, some for airplans spraying and others for being used as hot and cold fumes or repulsive compounds against insects brought by the wind - which have been applied with good results.

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SUMMARY

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3. In the Rumanian People's Republic, the forest vegetation covers 27 per cent of the total of the country area. The following species are predominant : Fagus silvatica (34.3 per cent), Picea excelsa and Abies alba (24.1 per cent) and Quercus sp. (21.5 per cent). There are valuable softwood ecotypes of high productivity (from 900 to 1300 cu.m. per hectare with individuals of breast height diameter up to 150 cm and height over 50 m) or high quality wood (of resonance) as well as hardwood (Quercus sessilis). Some exotic species adapted to our climate and cultivated in our country give higher yields than the native ones, e.g.: Robinia pseudaccacia (about 60,000 ha with an average yield of 300 cu.m. at 30 years of age), Populus x euroamericana (about 30,000 ha with an average yield of 360 cu.m.at 20 years of age) Pseudotsuga menziesi, Pinus strobus, and others.

4. As a means of studying and increasing the forest productivity considerable technical and scientific works have been planned and carried out which are presented in this report. In the period 1948-1955 all the forests have been managed (about 800,000 hectares annualy), while from 1955 on, large areas have been reforested (about 70,000 ha annually), the pests were controlled over large areas and the mechanization of forest works has been extended. At the same time, scientific researches have been carried out, the results of which led to the elaboration of : Forest typology (242 types), general tables for volumes (16 species) and sorting tables (12 species), yield tables (12 species), surveying methods, volume calculations and management methods (regular high forest, selection high forest and coppice), formulae and schemes for afforestation - per specific areas and types of forests - methods of detecting, prognosis and control of forest damaging factors, methods for the organization of work-yards, etc. Thus, a considerable experience and valuable scientific knowledge, used now in practice for preserving and exploiting of the woody area, have been gained.

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Agenda Item: C.6.1/C.6.2

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PROBLEMS REGARDING THE MECHANIZATION OF AGRICULTURE

By Prof. E. BARAT

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PROBLEMS REGARDING THE MECHANIZATION OF AGRICULTURE

by
Prof. E. Barat

The importance of the problem

1. The problem of the introduction of modern technique in agriculture - and within it, the problem of mechanization - is a preoccupation of ever larger circles of specialists in developing countries. This is easily understandable in view of the important place occupied by agriculture in the economic structure of these countries, while on the other hand, it is on the realization of an effective technical progress in this branch of national economy that the possibility of bringing under cultivation important areas of arable land, left outside the production process of many of these countries, is largely dependent, as are the possibilities of increasing the agricultural production necessary to the amelioration of food conditions of the population, of improving the quality of agricultural products, which plays such an important role in these countries' exports etc.

2. It is obvious that the concrete manner in which the problem is set and in which it has to be solved, differs appreciably from one country to another. In most developing countries, however, the problem of technical progress in agriculture is rendered extremely complex due to a whole series of factors (the structure of landed property, density of rural population etc.). Its solution should, according to us, take into consideration a number of general requirements, among which we mention:

a) The modification of the present structure of landed property which impedes technical progress, by the realization of land reforms by which those who actually work the land would own it. Such reforms would stimulate the peasantry to obtain larger crops, to bring new land under cultivation and to introduce agricultural machinery.

b) The consistent realization of industrialization, the purpose of the newly created industry being - among others - of supplying agriculture with up-to-date technical means, at favourable prices, and to absorb, at the same time, labour power from the countryside.

c) To find adequate inducements for attracting peasantry towards association forms (co-operation) in which the modern means of production supplied by industry could be rationally used, in common.

3. In this general context of problems and preoccupations, we propose to present, in our paper, the manner in which the problem of the mechanization of agriculture has been and is being solved in the Rumanian People's Republic.

The necessity of the mechanization of agriculture in the Rumanian People's Republic

4. The mechanization of agriculture, as a process based on the objective

economic necessity of raising the social labour productivity and the living standard of the country's rural and entire population, is achieved in Rumania, by a complex of measures, integrated into the general policy of building socialist economy and of its perfection. The objectives of this policy, as well as its realization, are established on scientific bases, by the multilateral, objective analysis of the development level of production capacities, of the structure and means at the disposal of national economy, leading them firmly, with the help of planning, towards attaining the proposed objectives.

5. In our country the mechanization of agriculture is organically linked with the creation of large state and collective farms, in a process of mutual conditioning. The results of this process, marked by the conclusion of the collectivization of agriculture in the spring of 1962, are edifying and permit the appreciation of the correctness of the road covered.

6. Before the second world war, the social-economic structure of Rumania and the development level of agriculture were characterized by several specific traits, shown in the following statistical figures: according to the 1930 census, the agricultural population represented 78.2% of the entire active population of the country, while the active industrial population was of merely 7.2%. The proportion of the national income derived from agriculture and forestry represented 38.5% of the national income obtained in the national economy (the one derived from industry representing merely 30.8%). According to the estimates of economist Colin Clark, in Rumania the national income per head of population was one of the lowest in Europe. This situation, in the conditions of the predominance of agriculture, was especially determined by the extremely low level of agriculture, of labour productivity in this field. In agriculture, the existing big landed property was based on a large scale on semifeudal relations: metayage and other forms of labour, while, on the other hand, there were millions of peasant farms, in an advanced stage of fragmentation, with very reduced economic capacities. In the whole country there were some 4000 tractors, i.e., 3700 ha. of agricultural land per tractor, 2500 ha of arable land respectively; half of the agricultural farms having up to 3 ha of land, and 30% of the farms with 3-5 ha, had no draught animal, the average being one ox reverting to five farms, and one horse to 7.8 ha. Agriculture was extensive, the agricultural implements were rudimentary. No tractor or agricultural machinery industry existed in the country. Among the numerous negative social-economic consequences, the following may be mentioned: low productivity per ha, very reduced productivity level of agricultural labour, a low consumption of agricultural and industrial products.

7. The backward state of agriculture, was aggravated by the consequences of the second world war. The damages suffered by the national economy amounted to 10,000,000 million lei, a sum equivalent to the country's budget for over 12 years (at 1945 prices).

The creation of a tractor and agricultural machinery industry, and the endowing of agriculture in the Rumanian People's Republic

8. In these conditions, the problems which were raised after the liberation of the country from the fascist yoke (August 23, 1944), were exceptionally difficult and complex. The 1945 land reform has abolished landed property and the remnants, in villages, of semi-feudal relationships, it has led to the appropriation of land to peasants with little or no land, thus contributing to the improvement of their economic condition. Among others, one of the foremost was the problem of equipping agriculture with tractors and agricultural machinery, as a condition for raising agricultural production and the living standard

of the population. But, mechanization is not always profitable in conditions of small peasant agricultural farms, therefore the problem was of transforming individual, fragmentated agriculture into an agriculture based on co-operative forms of production. The creation of such agriculture cannot be conceived without an important development of agricultural production forces, without the creation in villages of strong technical material production bases. In its turn technical material bases in agriculture cannot be created and promoted without an industry capable of producing the respective elements: tractors, agricultural machinery etc. Therefore, in the framework of the industrialization policy, special attention was lent to the development of tractor and agricultural machine building industries.

9. As a consequence, the tractor and agriculture machine building industry was set up, the output of which has grown year by year, both quantitatively and qualitatively.

a) The output of tractors and of principal agricultural machinery has increased as follows:

Table 1

	Unit	195o	1955	196o	1961
i) Tractors	pieces	3,469	3,5oo	17,1o2	2o,ooo
ii) Trailed ploughs	"	5,o3o	4,oo5	15,692	14,959
iii) Cereal drilling machines with mechanical traction	"	45o	1,428	14,322	15,216
iv) Combines for cereals	"	5o	-	5,5oo	6,129

1o. The increase in a steady rhythm of the home production of tractors and agricultural machinery is correspondingly represented by the equipment of agriculture with modern technique. Thus, while in 195o agriculture only received 3,466 tractors, in 1961 12,o98 tractors were delivered to it (the rest of the tractors having been exported). Thus, the number of tractors and agricultural machinery increased systematically during the entire post-war period, as may be seen below:

a) The number of tractors and of principal agricultural machinery in the Rumanian People's Republic in 1938, 196o and 1962 (summer):

Table 2

	Unit	1938	196o	1962 (June)
i) Physical tractors	pieces	4;o49	44,194	about 54,ooo
ii) Conventional tractors (15 HP)	"	4,858	65,29o	about 8o,ooo
iii) Mechanical drilling machines	"	-	33,948	over 5o,ooo
iv) Self propelled and trailed combines for cereals	"	-	17,577	over 25,ooo

11. As a direct corollary to the action of the technical equipment of agriculture, the proportion of surfaces for one tractor and one combine decreased, and the proportion between mechanical and animal energy employed in agriculture was modified. In 1938, mechanical energy represented 14.3%, and animal energy 85.7%, while in 196o the proportion of mechanical energy had grown to 76.5%, while the animal energy had fallen to 23.5%.

12. The mechanization of agriculture proves its economic efficiency in the large agricultural farms. Therefore, in the conditions existing in Rumania

mechanization cannot be separated from the process of setting up large socialist farms. Our agricultural experience has shown that the parcelled out property excludes the development of social productive forces of labour, social forms of labour, progressive application of science, the increased endowing with permanent funds and large scale animal breeding. Simultaneously with the setting up and the consolidation of large socialist agricultural farms, the degree of utilization of technical farm equipement has also grown. Thus, in 1951 a tractor belonging to the machine and tractor station had done 224 ha of normal ploughing, in 1961 such a tractor has done 475 ha of normal ploughing. Simultaneously the cost price per "hatru" (conventional ha) decreased: by 53% in 1960 and by 62% in 1961 as compared to 1952, which represent a reduction of 2.6 times (1952 - 1961). The respective figures represent an improvement in the use of tractors and an increase in their efficiency.

The increase in the number of tractors and agricultural machinery, and the extension of mechanization in the Rumanian People's Republic agriculture

13. The production of tractors and agricultural machinery must be permanently adapted to the necessities of agriculture; these necessities which result from the structure of agricultural production and the prospects of its development also take into consideration the development of technical progress and the increase in the degree of its applicability in the process of production.

a) In conformity with these requirements, the first tractors produced by our industry ensured the carrying out, in the first place, of heavy land works.

b) Lately, having in view the extension of the heavy works, the production of universal tractors was passed on to tractors with higher technical characteristics and which may be employed in a larger variety of works - as well as to the production of a larger range of agricultural machines. In the structure of the number of tractors, with which agriculture is equipped the proportion of universal tractors (UTOS 26 and UTOS 27) has increased considerably.

14. Number of agricultural tractors in the Rumanian People's Republic existing in 1955, 1960, 1961, on machine and tractor stations and on state agricultural farms, by principal marks:

Table 3

	Unit	1955	1960	1961
a) Total tractors of which:	pieces	19,489	42,691	50,794
b) UTOS 26 and UTOS 27	"	-	26,422	37,814
i) in % from total	%	-	61.9	74.4
c) KD and KDP	pieces	9,386	11,972	9,972
i) in % from total	%	48.2	27.8	19.6

15. At the same time, special attention is lent to the production of trailed combines for cereals, because they make possible the carrying out in a short time of the harvest by economizing labour and eliminating, to a great extent, the harvesting losses.

16. The agricultural machinery industry has enlarged, year by year, the range of machines produced, in relation to concrete necessities, resulting,

in the first place from the structure of cultivated surfaces. Within this structure, the highest proportion is that of cereal crops; hence the necessity of lending paramount attention to the problem of the complex mechanization of cereal crops and in the first place of that of the wheat and maize crops. Concomitently, the mechanization is extended to other crops as well: vegetables, vines etc. Increased attention is also lent to the mechanization of animal breeding.

a) In view of the above mentioned purposes, the range of agricultural machinery with higher technical characteristics has been widened. An exemplifying fact is that in 1961 about 9,000 mounted ploughs and about 1,600 mounted cultivators have been delivered to agriculture. In the state plan for the development of the national economy for 1960 - 1965, assimilation in the production of new, highly efficient agricultural machines is provided for.

17. In the investment volume assigned to agriculture in these years, investments for agricultural machinery and equipment, intended to accelerate the mechanical endowing of agriculture, have been systematically increased. Only for the 1950-60 period, investments in machinery, equipment and other stable funds, amounted to 18,078 million lei, which represents 1,260 lei per ha of agricultural surface. It must be kept in mind that the efficiency of these investments, as well as of the expenses made for land improvements, fertilizers etc., will gradually become evident, in an ever greater proportion, in the coming years.

The economic results of the mechanization of agriculture in the Rumanian People's Republic

18. The endowing of agriculture with tractors and farm machinery, in the framework of its development towards socialism, has been accompanied by considerable economic effects, the importance of which grows by the conclusion of the economic-organizing consolidation of collective agricultural farms. These economic effects of the technical equipment of agriculture materialize in a series of quantitative and qualitative realizations, such as: increased labour productivity, reduction of production costs, increased average and total production, improvement in the structure of cultivated surfaces etc.

a) The volume of works done by the machine and tractor stations has increased year by year. In 1955 they carried out 4,116,000 ha of normal ploughing, in 1960 - 14,180,700 ha, and in 1961 they achieved a volume of work 20,721,800 ha of normal ploughing. This represented a huge economy of labour, estimated at hundreds of thousands of workers a year. It is a significant fact that the increased volume of work was realized both by the increased number of tractors, and by a better use of them, as a consequence, in 1961 almost half of the number of machine and tractor stations achieved more than 500 ha of normal ploughing per 15 HP conventional tractor. The conclusion of collectivization creates the necessary conditions for a further increase in the out-turn per tractor.

b) With the increase in the volume of farm works executed by mechanized means, the degree of mechanization of each individual work has also grown considerably. Thus the degree of mechanization of the principal agricultural works on state farms has increased as follows:

Table 4

in % as compared to mechanized + non-mechanized

	1950	1960	1961
i) Ploughed	70.7	98.9	99
ii) Sown	58.4	96.1	96.8
iii) Harvested cereals	59.8	95.3	96.8

iv) On state agricultural farms these works are practically completely mechanized.

c) The mechanization measures have influenced the increase in total and average productions. The statistical estimates regarding the trend for a long period, show the systematic, firm increase in average production per ha, in all crops.

d) Another effect of the technical equipment of agriculture, and therefore of its mechanization, is the increase in labour productivity. Thus in state agricultural farms, the increase in labour productivity is characterized by the following figures:

Table 5

in %

Indicators	1955	1961
i) The capacity of mechanization means corresponding to 1oo ha of agricultural land	1oo	15o.3
ii) Average productivity per worker in agricultural activity	1oo	2o7.o

iii) To an increase of 5o% in technical equipment corresponds a growth of 1o7% in productivity, a fact which underlines the high efficiency of mechanization, and its influence on the consequent reduction in the cost price of agricultural products.

e) Especially important are the positive consequences of a social, economic and cultural character for the agricultural population whose living standard grows systematically, as well as the consequences for the national economy. They are organically connected with the entire development process of our country, in the conditions of the new socialist system.

The development of mechanization in agriculture in the six-year plan (196o - 1965)

19. State planning for the development of the national economy for the years 196o-1965 provides for important development and mechanization measures in agriculture, ensuring the necessary conditions for this purpose. At the end of the 196o-1965 period, it is expected that some 1oo,ooo physical tractors, more than 7o,ooo drilling machines, over 43,ooo combines for cereals, more than 8,ooo combines for maize, as well as other agricultural machines will be working in agriculture. In 1965, there will be one physical tractor for every 1oo ha of arable land.

2o. The technical equipment and the national utilization of machines, the use on a larger scale of fertilizers, the execution of agrotechnical works of good quality in shorter time and in the most favourable periods, will ensure the increase in agricultural production, in labour productivity, and the reduction of production costs, which will contribute to raise this important branch of economy, its contribution to the complex development of the national economy and, at the same time, the systematic improvement of the living conditions of the population.

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SUMMARY

Agenda Item: C.6.1/C.6.2

Romania

PROBLEMS REGARDING THE MECHANIZATION OF AGRICULTURE

By Prof. E. BARAT

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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PROBLEMS REGARDING THE MECHANIZATION OF AGRICULTURE

by

Prof. E. Barat

Summary

1. The problem of the introduction of modern technique in agriculture, - and within it, the problem of mechanization - is a preoccupation of ever larger circles of specialists in developing countries. This is easily understandable in view of the important place occupied by agriculture in the economic structure of these countries, while on the other hand, it is on the realization of an effective technical progress in this branch of national economy that the possibility of bringing under cultivation important areas of arable land, left outside the production process in many of these countries, is largely dependent, as are the possibilities of increasing the agricultural production necessary to the amelioration of food conditions of the population, of improving the quality of agricultural products, which plays such an important role in these countries exports etc.

2. It is obvious that the concrete manner in which the problem is set, and in which if has to be solved, differs appreciably from one country to another. In most developing countries, however, the problem of technical progress in agriculture is rendered extremely complex due to a whole series of factors (the structure of landed property, density of rural population etc.). Its solution should, according to us, take into consideration a number of general requirements, among which we mention:

a) The modification of the present structure of landed property which impedes technical progress, by the realization of land reforms by which those who actually work the land would own it. Such reforms would stimulate the peasantry to obtain larger crops, to bring new land under cultivation and to introduce agricultural machinery.

b) The consistent realization of industrialization, the purpose of the newly created industry being, among others, of supplying agriculture with up-to-date technical means, at favourable prices, and to absorb, at the same time, labour power from the countryside.

c) To find adequate inducements for attracting peasantry towards association forms (co-operation) by which the modern means of production supplied by industry could be rationally used, in common.

3. In this general context of problems and preoccupations, we propose to present in our paper the manner in which the problem of the mechanization of agriculture has been and is being solved in the Rumanian People's Republic.

4. The mechanization of agriculture in the Rumanian People's Republic has appeared as an economic necessity for raising social productivity of labour and the living standard of agricultural population, as well as of the entire population of the country. This purpose is achieved within the general development of national economy, and, in the first place, by the development of industry which ensures the improvement of the technical, material basis of agriculture.

5. Before the second world war, Rumanian agriculture disposed of an insignificant number of tractors and agricultural machinery (in 1938 about 4,000 tractors), while in the last few years the state has endowed agriculture with thousands of tractors, combines and other machinery produced by its own national industry. Only in 1961 the national industry turned out 2o,ooo tractors, 15,ooo tractor drawn ploughs, more than 15,ooo drilling machines with mechanical traction, 6,ooo combines for cereals. As a consequence of the permanent equipement, at the end of 1961, agriculture disposed of 52,ooo physical tractors - about 13 times as many as in 1938 - more than 23,ooo combines for cereals, as well as other machines.

6. The development of the technical material basis of agriculture has been closely interwoven with the formation process of large socialist collective farms, which have provided most favourable conditions for the application of the new technique in Rumanian agriculture. In its first stage, the mechanization process was directed towards the most difficult tillage works and gradually included an even larger range of vegetable growing, fruit growing and animal breeding works.

7. The endowing of agriculture with mechanization means has been accompanied by important economic effects, which materialized, besides facilitating man's labour - in the increase of labour productivity, in lowering production costs, in increased average and total productions etc. In state farms, for instance, in comparison to 1955, in 1961 to a one percent increase in the capacity of mechanization means, per loo ha, corresponds an increase of 2.1% in the labour productivity of a worker in agricultural activity.

8. In state planning for the development of national economy for 196o-1965, important development measures for the technical material basis of agriculture are provided for. In 1965 there will be one physical tractor for loo ha of arable land, thus ensuring complex mechanization possibilities for the majority of agricultural works.

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Israel

THE INFLUENCE OF THE COOPERATIVE SET-UP OF AGRICULTURAL SETTLEMENT ON THE AGRICULTURAL CREDIT SYSTEM IN ISRAEL

By Gershon KADDAR

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THE INFLUENCE OF THE COOPERATIVE SET-UP

OF AGRICULTURAL SETTLEMENT

No. 629 ON THE AGRICULTURAL CREDIT SYSTEM IN ISRAEL

C.1.2

by
GERSHON KADDAR

Israel agriculture has two principal characteristics: Its land-settling tendencies; its cooperative set-up.

There are many countries where agriculture has, or had, a land-settling tendency: the U.S. is an outstanding example. On the other hand, there are countries where agricultural cooperation is developed to a great extent (Denmark heads the list); but there is hardly a country where cooperatives of diverse types and on various levels have been used for the carrying out of a land-settling policy on a large scale.

As a result of the tendencies mentioned, the agricultural credit system has developed particular characteristics of its own - the greater part of credit is given with the view of realizing the land-settling objectives: populating the country and supplying the population with home-raised produce. Most of this credit, its allocation, management and collection is connected in various ways with cooperatives.

A. THE COOPERATIVE SET-UP OF ISRAELI AGRICULTURE

At the beginning of Zionist settlement in the country the set-up of the Jewish village was drawn up along the lines of European models, centuries old. Agricultural settlements were established, in which the organizational links among the farms were loose. However, after the passage of a relatively short time, the architects of Jewish land-settlement realized that a strong cooperative organization is imperative for enhancing the survival possibilities, both economic and social, of the farms under the prevalent conditions of settlement, i.e., antagonistic surroundings; settlers with a relatively high standard of living but lacking in agricultural and land-settling experience, while the capital that the nation allocated for land-settling activities never met all requirements.

Furthermore, the desire for social justice brought about an inclination on the part of the institutions in charge of settlement towards dividing the land and the capital at their disposal among as many settlers as possible instead of concentrating them in the hands of the few. Under these conditions came into being and grew up at the beginning of this century the primary cells of the Israeli agricultural cooperation: the collective settlement (the kibbutz) and the cooperative village of family farms (the moshav). Each of those two forms tried to go its own way towards the formation of a socio-economic system that holds attraction for its members and is capable of holding its own under Israeli circumstances.

The kibbutz (collective settlement) achieved that through far-reaching collectivization of all branches of production as well as consumer services, 50 to 250 families work together on a big farm (which contains sometimes also non-agricultural enterprises such as industry, health resorts, etc.). This farm is in joint ownership without there being the possibility of identifying or separating the particular share of each of the owner-members. In addition, it is the aim of the collective settlement to manage a joint gigantic household, so to speak, through a dining-hall, laundry and dress-making services, joint care and education of children and youth.

In the moshav, on the other hand, each one of its 50-150 families cultivates its separate farm unit usually of comparatively small dimensions. However, all the small-holder farms of the same settlement are united in one large cooperative which comprises marketing, purchasing means of production, and financing. The majority of these cooperatives also provide for the settlers various producer and consumer services such as joint maintenance of machinery, water supply, grocer, general education and specific training problems, etc.

Besides collective and cooperative settlements we also find ramified cooperatives in settlements of individual farmsteads, but these are similar to the cooperatives found in many other countries.

The collective and cooperative settlements are both organized into several settlement movements, each of which operating on a country-wide scale.

The main reasons for establishing and fostering these movements are: To safeguard the joint interests in the realms of economics and policy-making; ideological and political considerations.

There is no doubt that the national organization of the settlement movements did much to bring about rapid development of cooperative settlement by instituting mutual help among settlements. It also gave them added power to weather adverse circumstances through collective responsibility and the dynamic approach of the settlers to the solution of their problems.

Primary production is carried out mainly by the collective settlements and the farmsteads of the coope ative villages and to a lesser degree by cooperatives in certain cooperative settlements which jointly manage certain production enterprises, such as orchards, field crops etc.

On the basis of both types of settlements, collective and cooperative, there developed in time a variegated network of secondary cooperatives whose task it is to serve the collective and cooperative settlements in many fields. This network comprises the following branches: Marketing of produce (organized on a country-wide scale); Purchasing of means of production (organized on a regional and country-wide basis); Financing: Various auxilliary farming and consumer services, run mainly on a regional basis.

The agricultural credit system is based to large extent on these organizational tools and makes much use of them.

Marketing Cooperatives of Agricultural Produce

These cooperatives, and "Tnuva" first and foremost, play a most vital role in Israel's agriculture. Without them it is impossible to conceive the agriculture of this country.

"Tnuva" comprises some 500 cooperatives (kibbutzim, moshavim, etc), and its marketing activities form about 70% of the over-all marketing of agricultural produce in Israel - not including citrus.

"Tnuva" deals with the marketing of dairy and poultry products, vegetables, fruit, fish, saplings, flowers, etc. It has a unified financial and administrative management, but each type of produce has its own special department.

In the beginning, a number of "Tnuva" cooperatives were set up, one for each district, and that in order to see to it that with the help of the farmers of those districts coordination would be attained between the marketing facilities and the products and marketing possibilities of the various districts.

In time, and together with technical development, it was realized that in a small country the regulating of marketing calls for the hauling of large quantities of products from one district to another. For this reason a main coordinating system was set up under the name "Central Tnuva". Eventual development brought about gradual strengthening of "Central Tnuva", so that in the course of time the district "tnuvas" came to be the branches of this center.

The directorate of "Tnuva"comprises representatives of settlements elected by the settlement movements. In time, there emerged a cadre of permanend and gifted functionaries who brought "Tnuva" to its present dominating position in the marketing of agricultural produce in Israel.

"Tnuva" controls many packing, processing and canning plants. The building of these plants was financed by taking certain excises from the produce delivered by members, in addition to outside loans, mainly from government development funds. The latest innovation is turning part of these excises into a revolving fund paid back to the farmers after a certain number of years.

"Tnuva" is a unique experiment - perhaps the only one of its kind - in setting up a marketing cooperative whose members are primary cooperatives, which deals with wholesale marketing of most types of agricultural produce on a country-wide scale. This is made possible thanks to the exemplary soci-political decipline typifying the Israeli agriculture.

As will be explained later, the undertakings that "Tnuva" is ready to take upon itself are among the most effective tools in the Israeli agricultural credit system.

As a result of surpluses of various types of agricultural produce, the government, at the initiative of the Ministry of Agriculture, has set up a network of produce production boards; The position that "Tnuva" has attained give it considerable influence on most production boards.

The Supply System

Unlike the marketing of produce where there is a marked tendency towards country-wide centralization following regional or local beginnings, the trend of development in the field of purchasing supplies for the farm has passed from country-wide centralization in the initial stage to district organizations in the past few years, and this without losing contact with the countrywide cooperative for the purchasing of supplies, namely "Hamashbir Hamerkazi". This cooperative developed eventually in several additional directions.

Today some 20 purchasing organizations are active in the field of buying fodder, fertilizers, insecticides, fuel, grocery supplies, etc., most of which are organized on a regional basis. A typical purchasing organization centralizes the purchasing of the means of production from 20-30 collective and/or cooperative settlements. As a result of concerted purchasing from the primary source it can get convenient prices and credit conditions from the suppliers. Loans given to a purchasing organization are insured, among others, by the mutual endorsement of its member settlements.

The purchasing organizations have a very good repute on the Israeli credit market. In addition, these organizations serve as representatives of the settlements to the government in the case of negotiations on subsidies, payments for damages caused by natural elements, government loans, etc., and all that in accordance with the agricultural requirements of the region.

The directorate of the purchasing organization is elected by representatives of its member-settlements. There is a joint secretariate for all purchasing organizations which is concerned with coordinating their activities on a country-wide scale, as well as representing them jointly in dealing with government authorities, banks, etc.

Consequent upon regional (vs. country-wide) organization, there is very close relation between the activities of the organization and the requirements of the farm.

Lately there have emerged 3 developments:

- A number of purchasing organizations have added to the purchasing of supplies the construction of big feed mills. Besides, they have built additional installations to serve their members in the fields of produce sorting, refrigeration warehouses, slaughterhouses, etc. As a result of this development, the organizations have turned into industrialists owning permanent assets valued at tens of millions of Israeli pounds.

  So far, it has not been determined in how far the above combination influence the achievement of the primary objectives: insuring supplies to the farm at a low price and convenient credit terms.

- The second development has been the entry of the organizations into the fields of marketing agricultural produce. Today some of them serve as regional agents of the country-wide marketing institutions in certain types of produce. The control over the returns from the marketing of produce facilitates the collection of the organization's dues from its members. However, it has not been fully ascertained yet to what extent will the changing of the regional organization from a line-cooperative to a more comprehensive one will change the organizational set-up of agricultural settlement.
- An interesting fact can be observed in the newly established agricultural settlements. Here the local cooperatives are weak in part owing to the lack of efficient leadership. Consequently, it is not surprising that there is a tendency to by-pass the local cooperative by establishing direct contact between the regional organization and the individual settler in the field of both the purchasing of supplies and the marketing of produce.

Other Regional Cooperatives

A typical settlement comprises 70-100 families. It has been found that neither the size of the population nor the volume of production of a settlement of this size are sufficient for insuring a fair amount of efficiency in the various activities of marketing as well as the producer and consumer services.

Almost from the beginning of cooperative settlement in Israel there has been a trend towards regional organization so as to insure sufficient scale for the carrying out of certain economic op rations. Lately this development has gained renewed momentum and there is even an opinion that regional organization may be the tool for enhancing the economic and political standing of agricultural settlement.

All regional cooperatives are secondary cooperatives in that their members are collective or cooperative settlements and the like, and not individual settlers. A considerable portion of the cooperatives (and especially the newly established ones) are organized parallel to regional councils, which are the municipal bodies of the agricultural regions, comprising generally 10-20 agricultural settlements.

Typical activities of such cooperatives are: Maintenance and operation of trucks; maintenance and operation of heavy agricultural machinery (tractors for earthmoving operations, cotton pickers as well as machinery for lifting sugar-beets and potatoe-picking); maintenance and operation of refrigerating warehouses for agricultural produce; industrial services:- cotton, gins, alfalfa-drying plants, poultry slaughter-houses, bakeries, etc; maintaining regional schools: primary, secondary and vocational; special bus service to students of these schools; evening classes for adults; regional laundries; theatrical performances.

There are intentions (and even humble actual starts) to base the industrialization of the rural areas to an increasing extent on regional organizations.

Activities within the framework of the regional cooperatives have several conspicuous advantages: They enhance the extent of an operation, thus making for efficiency, improvement and lowering of prices; they provide greater possibilities for employing hired labour without affecting directly the principle of self-labor which is important from a social standpoint to both collective and cooperative settlements.

However, many of the problems connected with that have not yet found their solution. Among them are: Does every settlement in one region have to support each regional activity, or should participation in each regional service by voluntary? Is every field of activity to be organized as a separate cooperative or must a regional cooperative be established to cover all or most activities? Again, should the central regional cooperative operate directly or through affiliated branch cooperatives? Where should the line be drawn between municipal activities based on budgetary considerations and cooperative activities based on profit-and-loss?

Even today, regional cooperatives in all their forms are an important means for granting a part of the loans given to agricultural settlements, and there is ground for expecting this trend to assume bigger proportions in the future.

<u>The Israeli Experience in Setting-Up "Guided Cooperatives"</u>

Before the State of Israel came into being, the settling institutions did not have to put great efforts into organizing groups of candidates for settlement.

After that date, when the majority of immigrants came from non-developed countries (Asia and Africa), the new ones were found lacking in know-how and inclination towards cooperation, which is one of the corner-stones of cooperative settlement.

The institution in charge of settlement - with the help of the settling movements - had to spend great efforts in organizing groups of candidates for agricultural settlement. After a long set of experiments, it was concluded that

it is better to organize the candidates for one village on the basis of ethnic and social homogeneity.

The lack of candidates for agricultural settlement eliminated elaborate classification of candidates. However, the institution in charge of settlement reserves the right to expel from the settlement any new settler who causes to the public harm of an economic or a social nature. For this purpose law was passed in 1953, known as "The Candidates for Agricultural Settlement Law", according to which it is possible to eject from the settlement any candidate within three years of the date of his settlement for the following reasons: (a) Methodical neglect of cultivating his land (b) Intentional damage done to the property of the institution in charge of settlement, or misuse of this property, (c) Disregard for the cooperative regulations, (d) Disturbing the peace of the settlers by using force or threatening to use it.

As has already been mentioned, most of the settlers lacked agricultural and managerial know-how at the initial stages of their settlement. For this reason, a training and extension service was organized in the fields of agriculture, management and home economics.

This service was originally based on workers not from among the local settlers.

As an additional step there has evolved in the last few years a system of temporarily managed settlements operating as follows:

The new settler assumes responsibility in the beginning for only a small part of his land (which includes the house he lives in) while most of the land is managed as a large farm by a public or private company. The manager of this farm is required to employ the new settlers as hired labor in his agricultural operations. In time, centralized cultivation by outsiders is brought to a minimum and finally abolished, while the settler's farmstead is gradually enlarged.

In the variegated array of cooperatives in Israel there are a few secondary cooperatives operating on a national scale that may be of special interest to other countries: mutual insurance cooperatives; cooperatives operating artificial insemination services and cooperatives for the upgrading of poultry.

B. THE AGRICULTURAL CREDIT SYSTEM IN ISRAEL

Jewish agriculture in Israel is characterized by the extensive use of capital. The great demand for capital is due to the fact that in a short time tens of thousands of families lacking any capital of their own as well as agricultural know-how but of a relatively high standard of living - were settled on the land. Fertile land suitable for settlement is relatively limited and consequently intensive agriculture had to be practised n relation to the available capital. Providing the settlements with elaborate irrigation networks as well as numerous live-stock called for heavy investments.

In spite of the fact that economic operations in the course of a few decades, together with devaluation, brought about considerable accumulation of owned capital, especially in the old-established and most efficient settlements, yet in the majority of settlements 'investment' is more or less synonymous with 'loan'.

The national institutions and the State have both made great efforts to mobilize the means necessary for establishing an extensive and elaborated agricultural credit system.

The main components of this credit system are:

Loans to Agricultural Settlement

These are given by the national institutions and especially "Keren Hayessod" which is the agency that gathers the donations given by world Jewery for Jewish settlement in Israel.

These loans include about 2/3 of the institutional loans to agriculture (about IL.650 million by the end of 1961). They are intended for the establishing of new villages and for furnishing them with elementary buildings (both of a producer and consumer nature), with the basic livestock as well as the basic workings capital.

The settler does not assume any financial responsibility upon receiving the farmstead. The first investment capital is given for a probation period (on a licencé basis) during which the settler receives vocational training and adapts himself to the conditions of the settlement and its way of life.

Only after the settler has been trained, from a technical as well as a business management aspect, to support himself, and after the investments in his farm have reached about 70% of the amount of investment required for a farmat full development - in accordance with the regulations drawn up by the institution in charge of settlement - are the ownership and financial liabilities passed to him in relation to such investments as have been agreed upon to be considered as loans.

When a certain farmstead is ready for self support, a plan for additional investments required for the completion of the farm in accordance with the above regulations is drawn up for him by the settling institution; he is made to sign a suitable contract and - within a certain period - the means he lacks for his "establishment" are put at his disposal.

For the whole period from the day of his settlement till he reaches the stage that ensures the ability of self-support - a period that may extend over 5 - 10 years - the settlement has to sign agreement whereby the property is given for his own holding, and for his own use only. The settler is responsible for maintaining and renewing it.

Finally loan contracts are written. During the first two years the interest only is paid. The laon is refunded in the course of the remaining 25 years at 3½% interest. As a security for these loans, the lease of the farmstead is mortgaged.

Development Loans

From the time the State of Israel came into being till the end of 1961 there were put at the disposal of both Jewish and Arab agriculture sums to the amount of approximately IL.160 million* (about one-sixth of the whole institutional credit for agriculture) the origin of which was in the development budget of the State. The budget is financed by taxes and long-term loans in the country and abroad.

The main agency for making these loans is the Agricultural Bank of Israel - a government bank operating without branches and without intermediaries.

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* excluding housing loans.

A typical loan from development funds is given for a period of 10-12 years at an interest of 6½%. As securities are used cattle mortgages on machinery and livestock, pledges of marketing agents and sometimes also the mortgaging of land-lease ranking equally (paripasso), with the mortgage in favor of the settling institution.

In the past the loans were given mainly in accordance with object, i.e. anyone who made a certain investment (such as widening the irrigation network or planting an orchard) was capable of getting a government loan covering 50-80% of the investment, provided that he gives suitable securities.

Raising the efficiency of the farms - unlike the mere increase of their output - required the allocating of development funds on the basis of a comprehensive operation plan which checks carefully the profitability of the investments and the funds complementing the development loans.

In the past few years most of the development funds have been given linked to the dollar or to the cost of living index. With the devaluation of the Israeli pound at the beginning of 1962 serious problems came to the fore in connection with financing many settlements, and public committees are now trying to find ways of alleviating the burden of additional payment that is weighing down the farms as a result of linking the loans given to them.

As for the future, there is a tendency towards substituting the linking of long-term loans by a premium that the government collects from debtors: and in return the government shoulders all responsibility concerning linkage in relation to the creditors.

Bank Loans to Farmers

Bank loans to farmers reached at the end of 1961 the sum of IL.170 million (a sum similar to that of development loans) and constitute more than 1/6 of institutional financing agriculture.

The State's interest in land settlement, the trend towards increasing agricultural produce and the massive organization of agriculture (for the greater part on a cooperative basis) have led to the fact that loans to agriculture amount to 20% of all bank loans. This percentage is considerably higher than the share of agriculture in national income and than the share of the farmers among the earners of the country. On the other hand, bank loans have served to a considerable extent to complement insufficient capital resources for long-term investment, and this in spite of the fact that the loans were given - nominally - for only a short period, usually up to one year.

In Israel there is close government control over bank credits. The aims of this control are to limit the amount of credit as a counter-measure to the inflationary pressure in the economy and qualitative direction of part of the loans.

About IL.100 million of the bank loans to agriculture are termed "controlled credits", i.e., it is given according to a plan prepared each year by the Ministry of Agriculture and the Bank of Israel. The aim of the plan is to encourage the stepping up of production of vital products, which bring profit to the State, by giving advances. These loans are given at 9% interest whereas the Interest Law limits the banks to allocating "uncontrolled" loans given to agriculture (and industry) at 10% interest. However, the excessive demand for capital has brought about a wide

black market for credit where loans fetch a much higher interest.

The cooperative organization of agriculture should facilitate the centralization of credit activities among others through an extensive use of the pledges of marketing cooperatives as well as the mutual guarantee of the settlements (as will be explained later on) for securing loans.

On the other hand, there are in Israel more than 60 commercial banks besides scores of financial institutions, and the typical cooperative village deals with many banks and financial institutions. It appears then, that in spite of the cooperative nature of agriculture - itself aiming at centralization - the credit system is widely split up. Consequently, financing costs with the settlements are high, and comprise direct and indirect visible and invisible elements.

Within the framework of stepping up efficiency in performing farm operations, which is essential for lowering the cost of production and increasing the income of the farmers, steps should be taken (and the initial ones have already been taken) to make capital available at a lower cost, partly through concentrating the financing of each settlement into few hands; meanwhile trying to adapt the lending arrangements to the seasonal financial requirements and repayment ability of the farm.

Maybe the credit system should gradually shift to one-stop-banking of the farm. In this respect, an interesting experiment has already been made in the form of supervized credit for some kibbutzim and moshavim.

Securities in Agricultural Credit

The classical security of agricultural credit is the mortgage on the farm land. This form of security is in very limited use in Israel and only a small portion of the overall agricultural credit and a negligible part of bank loans to agriculture are insured in this way.

The majority of farm lands in Israel are under national ownership and they are leased to farmers on a long-term hereditary lease. It would seem that the absence of private ownership of the land is what prevents the Israeli farmer from resorting to land mortgages for his loans.

But that is not the case. Legally, it is absolutely possible to get a mortgage on leased land (similar to the mortgage on lease-hold); however, the settlement and cooperative nature of agriculture removes from the mortgage its practical value which is inherent in the ability of the creditor to assume ownership of the property and sell it to a third party in case the debtor does not fulfil his engagements.

The possibility of taking over the property and passing it on to a third party is hardly found in Israeli Cooperative agriculture.

The kibbutz farms, for instance, cannot be sold for political and settlement reasons. Deserting a kibbutz and breaking it up is considered something like a "catastrophe" from the standpoint of its foster movement which, allied by the settling institution, does everything in order to recruit new settlers to fill the place of those who have left. There has not been a single case in which a kibbutz was sold by its creditors in the history of Jewish settlement in Israel.

The situation is similar in the moshav: although the members farmsteads are occasionally offered for sale, yet there is no practical possibility for the creditor to sell the farm to another settler without the sanction and active help of the moshav cooperative. However, in case there is cooperation between the creditor and the cooperative management, there is no need to execute the mortgage

in order that the creditor gets his money back.

How, then, are the majority of agricultural credits secured? Loans of hundreds of millions of Israeli pounds are essentially secured in two ways: pledges of marketing agencies (mostly cooperatives) and mutual guarantees worked out according to a system to be described hereunder.

Pledges of Marketing Agencies

The typical farm has very close socio-political relationships with a certain wholesale marketing agency. It may be said that most farms "are born into a certain marketing agent". This marketing agency serves as a central link in the credit system.

Formally, the marketing agent's aid in securing the loan is extended in two ways: The conditional pledge of the marketing agency, i.e., the agency undertakes to repay the farm's loan if and when the farm does not repay it according to schedule, if and when there is money to the credit of the farm with the marketing agency and that at the creditor's first demand.

Pledges to transfer sales' returns of the settlement's marketing proceeds to its bank account. In this case the bank naturally puts the remainder of the proceeds after deducting repayments of the loan at the disposal of the debtor.

In practice conditional pledges of marketing agents are prevalent.

Mutual Guarantees

Years ago the Israeli cooperatives used to directly endorse each other's pledges. This practice proved to be unsatisfactory in that the creditors were unable to get a clear picture of the guarantees given by each cooperative - their amount and nature.

At quite an early stage there were set up by the settlement movements funds the original aim of which was to extend financial guarantees to their members in order to make it easier for them to raise loans. This applies particularly to those cooperatives which constitute the greater bank risks.

In time these institutions accumulated a considerable amount of owned capital sufficient for covering their guarantees. However, they developed eventually into financial institutions extending large amounts of loans and making investments in addition to the above mentioned guarantees.

These funds have a good repute on the Israeli credit market. This repute is due to their prompt payment of any claim based on their guarantees. However, the amounts of guarantees realized so far have been relatively small. Till now the funds have not stood the test of vast repayment of their guarantees as they are liable to come when agriculture faces a serious financial crisis without the public hand being ready and/or able to come to its aid.

It is an open question whether the accumulating of funds is the least expensive way of extending guarantees of the type described. It may be possible to initiate a guarantee system based less on the accumulation of capital and more on reinsurance, and that in order to make guarantees less costly.

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FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

SUMMARY

Agenda Item: C.1.2

Israel

THE INFLUENCE OF THE COOPERATIVE SET-UP OF AGRICULTURAL SETTLEMENT ON THE AGRICULTURAL CREDIT SYSTEM IN ISRAEL

By Gershon KADDAR

Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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THE INFLUENCE OF THE COOPERATIVE SET-UP OF AGRICULTURAL SETTLEMENT ON THE AGRICULTURAL CREDIT SYSTEM IN ISRAEL.

by Gershon Kaddar.

SUMMARY.

We have given here an outline of the cooperative set-up of Jewish Agriculture in Israel. This set-up is not based on theoretical directives but has come into being in answer to a national challenge: to create a modern form of agriculture in antagonistic, economically undeveloped surroundings, with the help of settlers, lacking any means of their own as well as agricultural experience, but having a relatively high standard of living.

With the help of ramified and variegated cooperative organizations, it has been possible for Jewish settlement to gain unprecedented momentum; to preserve its vitality, hand in hand with maintaining reasonable social relationships on the basis of voluntary work and with a minimal use of pressure on the settler.

In order to absorb the settlers from among the latest wave of mass immigration - most of whom being from nondeveloped Asian and African countries - a "guided cooperative" system has been elaborated in the past few years for the transitional period until new settlers acquire managerial and agricultural know-how.

Despite the large sums, raised mainly be Jews all over the world, the resources of capital have never been able to catch up with the legitimate requirements of agricultural settlement. On the other hand, most of the funds were under the superivision of national institutions and the State.

With the help of the large network of cooperative organizations, it has been possible to absorb large sums of agricultural credit, the overwhelming of which has been utilized in a rational way. This system overcame many of the numerous difficulties and flaws in supplying capital to agriculture.

This credit was absorbed almost without resorting to the usual security in farm credit: the farm mortgage. Nevertheless, regular repayments of big loans were insured through the cooperative network, and especially through comprehensive cooperative marketing, through centralized (regional) purchasing of the means of production and through mutual aid arrangements of the settlements as expressed in the independent financing institutions of the settlement organizations.

To other countries, the Israeli experiment is interesting mainly from the standpoint of developing undeveloped regions and for the fact that we have succeeded in establishing agriculture with the help of settlers lacking in agricultural background.

Some starts have been made towards finding solutions to additional problems of an international nature, and we hope that we shall be able to contribute to international know-how in the following fields as well:

- Establishing industry in the village and amalgamating it with the village autonomy economy;
- Developing the services in the village economy to a degree that safeguards the village against turning into a concentration of economically and socially backward elements.

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Yugoslavia

THE DEVELOPMENT OF AGRICULTURAL EQUIPMENT

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Belgrade

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THE DEVELOPMENT OF AGRICULTURAL EQUIPMENT

By Drače DŽEMAL

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1. Before the Second World War there was no abandoning of villages by their inhabitants in Yugoslavia. On the contrary, the absolute number[1] of village inhabitants was constantly increasing. Small land properties[2] prevailed not grouped together, but consisting of a great number of small areas scattered everywhere around. A far greater part of the agricultural products went in covering the mere wants of the producers themselves, and selling of the much smaller part, meant for the market, even at the low prices of agricultural products, was very difficult. Regarding small incomes in general, and high prices of industrial products and great contributions in money to the state (income taxes and other state and local taxes) the majority of agricultural producers were not able to afford any money for enlarging their production, not even for comparatively small investments in order to apply more modern means of production, at that period there were no efforts for advancing agricultural production not even by the state, therefore agricultural services were very poorly organized and utterly inefficient.

2. In such general and economical conditions not only agriculture but all other economical branches also made a really slow increase, what resulted in stagnation of agricultural production of all farmers; applying of modern technical achievements in agriculture, without taking in consideration some rare exceptions, was almost completely left out. There were several obstacles for getting more modern agricultural equipment (even on such land properties which, regarding their size or character of their production, were able to do that), such as: abundance of not sufficiently employed hands, comparatively high prices of agricultural equipment (regarding the prices of agricultural products) as well as insufficiently trained producers who were not able to make their best of modern agricultural equipment.

(a) For the major part of areas, for a series of operations (which, however, on the whole, regarding other European countries, represented cultivation at a very low level) exclusively hands and hand-tools were used. The most wide spread handtools included shovel, hoe, sickle, scythe and rake. The only operation, not performed by hand-tools, owing to the nature of the work, was the operation of ploughing, for which besides an iron plough, a ploughshare was largely used, particularly in considerably backward hilly areas. The greatest attainment were practically tools drawn by teams, which were, when talking of ploughs and harrows, rather wide spread, while other tools drawn by teams and other machines were much less used and almost exclusively on agriculturally developed, flat areas and on large estates. Such areas and such estates comprised about a quarter of the total ploughable land or nearly 2,000.000 acres. Among tools drawn by teams and machines used on those areas were included: sowers primarily for corn

1) In 1931 in Yugoslavia there were 10,760.000 farmers, or 76%, and in 1939 11,608.000 or 75% of the total number of the inhabitants.

2) According to the census of 1931 there were to 2 acres in size 33,8%, and more than 50 acres only, 0,36% of the total number of the farms.

(all kinds except maize, grasscutters primarily for herbs, reapers for wheat, self-binders, rakes drawn by teams, etc.). The largest and most complicated, but still comparatively quite commonly used machine (which very often was not owned by an agricultural producer, but by a village shop-keeper or by a craftsman, or by some other persons) was the steamreaper. The need of finishing the reaping of cereals in the shortest possible period of time because of dangerous damages which might have been caused by weather conditions, made this machine for the owner highly profitable and especially so because he was given a large portion of cereales as a reward for his services.

(b) During the last years before the Second World War 2300 imported tractors were used in agriculture and a very limited number of machines combined with them (ploughs, disks, harrows, much more rarely sowers, etc.). Steam ploughs, tractors and reapers of a larger make, as well as other kinds of larger machines were used only by a smaller number of estates during the last years before the war. How rare a machine tractor was is clearly indicated by the fact that at average 3400 ploughable acres of land were done by a tractor, that is to say proximately about 850 acres of ploughable land in exclusively agriculturally flat areas.

(c) On the total sowing area of about 7,200.000 acres, including the total number of a little above 2,000.000 of farms, during the last pre-war years there were in use (according to the estimation done immediately after the war) about 1,300.000 ploughs of different kinds (this number did not include ploughshares), only about 48,000 sowers for corn (except maize), about 22,000 reapers and grass-cutters and about 18,000 thrashing machines of different kinds. As it could be seen from above given figures, avery farm did not even possess an iron plough; sowers for corn (excepting maize) were possessed by about 2,5% of the farms, and reapers and grass-cutters by about 1% of the farms. Owing to the fact that at that time corn (excepting maize) was sown on priximately about 3,300.000 acres, the work on proximately 185 acres was performed by a thrasher. Thrashers were often used during the whole summer time, but in spite of that a considerable part of thrashing was done by using cattle or horses.

(d) More simpler agricultural equipment (tools, hand instruments, ploughs drawn by teams, harrows also drawn by teams, small sized sowers, sprayers, wind-mills and other similar machines) were produced in the country in an insufficient number, while other machines represented articles of import from developed west European countries. One can have an idea of the number of imported machines when we say that the total import of machines in 1939 amounted to about 2,541 tons. According to all other comparisons (in regard to other countries and actual needs considering the size of tillable areas) as well as according to imported quantities, the country production of agricultural machines (including tools) was very modest, and in 1939 it amounted only to 4.870 tons.

3. However estimated the equipment of the pre-war agriculture was very small. Taking into consideration such equipment, naturally, there could be no question of applying technological products at that level, applied in developed countries. On the other hand it strongly affected the amount of gained crops. Three most important cultures which in the physical volume of total plant production comprised nearly 55%.in the period of 1935-39 the average crops amounted with wheat to 12.2 mtc - acres, with maize 16.8 mtc. - acres and with sugar-beet 191 mtc. - acres.

How low were these crops is clearly seen from the fact which indicates that almost in the same period of time (1934 - 38) on the territory of what is now the Federal Republic of Germany, the agriculture of which was well equipped, at the average crop of wheat was 22.1 mtc. -acres, on the territory of France 15.6 mtc - acres and Great Britain 23.1 mtc. - acres. In the same period crops of sugar-beet amounted to 356 mtc. - acres in the Federal Republic of Germany, 276 mtc. - acres in France and 221 mtc. - acres in great Britain.

4. Owing to the changed social-political and social-economical features in post-war Yugoslavia, essential changes took place in structure and organization of agriculture compared to the former conditions. In the first place, immediately after the war, the agricultural reform was carried out by means of which private properties were limited up to a maximum of 10 acres, and the estates of various banks, the church and so on, were nationalized. The social land

fund created in this was, as well as by confiscating the properties formally possessed by the enemies, were used to establish social agricultural state farms, and also partly cooperative farms. In the early post-war years a strong movement for uniting the individual producers sprang up aiming to make them all join agricultural cooperatives,3) which at that period started their activities as bodies for getting and selling the goods; and later on they were transformed into producing farms of a specific character.

The subject we are making a report of was certainly essentially influenced by the whole post-war economical development, particularly by the process of industrialization, which apart from other things had a decisive influence on the general change of economical structure of inhabitants as well. The intense industrialization enabled a quick increase of employment outside agriculture. It led to a quick abandoning villages on the part of agricultural population and of its not only relative but absolute decrease. In 1961 51% of total population earned their living by cultivating the land (including forestry and fishing). All that together changed considerably the status, character and structure of agricultural farms.

5. Even in the course of the first post-war years a considerable attention was paid to agricultural mechanization in Yugoslavia. Only by using tractors and other large machines it was possible to cultivate new social collective farms, largely formed on the land of the deserted estates, which, therefore, demanded hands. Only by using big machines it was possible to cultivate the land of a great number of cooperative farms mostly formed by the people who had just been awarded land from the social land fund, and by poor farmers in general who needed badly all possible means for production including tools and machines for cultivating the land. In those early years all machines as well as a great quantity of tools were obtained by import. As one of the most efficient solutions for the use of so obtained machines, which were of highly different provenience and also not sufficient in number, was using them through so-called agricultural machine services. They were specific social enterprises, with the aim to do services in cultivating both social state farms and cooperatives, and where it was possible to give help to individual producers as well.

(a) Althouhg these enterprises were abolished after 5-6 years while they were doing various services, they had achieved some good results in the course of their work. They enabled more efficient using of the insufficient number of machines, and that in the time when those machines were badly needed; furthermore they secured repairing and keeping in good order the machines in their work-shops; they had trained the first tractor drivers and agricultural mechanics; and finally, it was through them that the first experiences in mechanization of different processes in production were achieved, as well as in the organization and economy of work dealing with big agricultural machines etc. Agricultural machine services were abolished in 1952, at the moment when the objective reasons for their abolishment were most convenient, when social collective farms and cooperative farms had already been strong both in respect of their organization and members, and when they were capable to take into their possession not only the machines of the abolished services, but also a great number of new machines.

6. The social community, as much as it was capable, forced simultaneously both the development of the domestic industry of agricultural machines and their import from abroad during the whole post-war period. It was done in order to introduce modern means of production which would enable a much more efficient cultivation of all areas belonging to social collective farms and cooperative farms as well; and with the aim to enable the same kind of cultivating the areas of those individual producers who could not obtain the most necessary means for production, but who had found their economical interest in cultivating their land in cooperation with collective farms.

(a) The range of the pre and post-war production of agricultural tools, instruments, machines nad tractors could be seen from the following table:

in tons

Year	Agricultural tools instruments and machines			Tractors		
	Output	Import	Export	Output	Import	Export
1939	4,874	2,541[x]	33	-	-	-
1946	9,511	1,289[x]	-	-	-	-
1950	17,016	2,941[x]	4	-	-	-
1951	15,252	750	12	2,595	3,143	-
1952	9,754	4,770	20	2,706	9,721	-
1953	11,780	884	476	3,104	5,913	-
1954	12,834	493	964	3,144	820	-
1955	18,595	511	628	3,073	1,262	-
1956	18,943	2,427	957	6,179	5,004	5
1957	21,952	6,000[xx]	4,428	9,427	12,000[xx]	-
1958	21,990	7,500[xx]	1,611	11,115	13,000[xx]	5
1959	27,691	4,871	1,609	13,305	4,090	
1960	32,882	10,916	4,650	15,971	8,127	

Table 1

x) the import of tractors is included.

xx) proximate estimation.

7. The economic policy of new Yugoslavia required grants from the Government for building domestic industry of agricultural machines. There were three reasons for that: first, it was thought that by developing domestic capacities which would produce agricultural machines and introduce the machines in general use better effects might have been achieved in the development of agriculture itself than by, perhaps, undertaking a whole series of other measures. Second, it was taken in consideration that it would be impossible to spare enough payable means for importing machines, because large investments in general were already forseen. And third, bearing in mind, that the conditions and situation in Yugoslavia required production of suitable types of agricultural machines.

(a) Already in 1946 the production of agricultural tools and agricultural instruments in the re-established, re-constructed and enlarged capacities of domestic industry was twice greater than that in the pre-war time. In the further development of this industry both the increasement of the existing capacities and the enlargement of the assortment in production were simultaneously approached. The first phase was the production of sowers, drawn by teams, grass-cutters, reapers and the like; and then also achieving the production of motor-reapers (of different type and size). In 1950 and 1951 the production of agricultural tools and of above mentioned and other agricultural machines attained the number which was several times bigger than before the war.

(b) With regard to the needs of agricultural social collective farms (having in view their structure at that time) were comparatively quickly fully satisfied with primitive machines drawn by teams, while on the contrary their needs for bought modern agricultural machines were not satisfied in the least. Namely, in that period about 7.000 of cooperative (producing) farms comprised about 25% of the total tillable land, while agricultural social collective farms comprised further 4-5% of land. At that time, the mere lack of big agricultural machines was one of the most important reasons which prevented further formation of such cooperative farms, and later on it was partly the cause for their abolishment, too. The lack of tractors and other big agricultural machines was also one of the reasons of the stagnation in crops and production of social collective farms, as well as of the poor results in their management in general. The-

refore the following phase in the development of the domestic industry of agricultural machines showed an achievement in production of machines which could be combined with tractors, finally, by means of buying different licenses, in 1953 the production of tractors was achieved as well.

(c) Since 1953 both the capacities and production of agricultural machines have been constantly increasing. Nowadays Yugoslavia has such capacities which are capable to produce about 12.000 tractors of various types (with the required instruments and tools) and about 2.500 different kinds of combines, besides other machines. The total number of capacities for producing all kinds of agricultural machines, including tractors, amount to 50.000 of tons. Such an advancement of production of agricultural equipment enabled Yugoslavia to start exporting agricultural machines in spite of her being forced to import some kinds of machines. The number of machines exported during the last two years is bigger than the total amount of production before the war, and the potential capacities for further increasement of export with regard both to the quality and quantity and assortment of production are really remarkable.

(d) Being developed and managed in this way, the industry of agricultural machines had to be accommodated to a number of various factors, which had to be taken in consideration. Namely, all changes in the structure of agricultural social collective farms, in the structure and technology of agricultural production, and in the organizing of the production and the work, as well as a series of other changes which took place in the post-war development of agricultural (in the first place social) collective farms, had definite repercussions on the demands which the agriculture required from the industry. First of all the farms which possessed more land asked for bigger machines, therefore every enlargement of agricultural social collective farms (what represents a never stopping process) increased the demand for big machines, and at the same time decreased the demand for smaller ones. Various other changes were characterised by similar repercussions.So,for example in the technological process which aimed to obtain 20 - 25 mtc.of wheat per acre, social collective farms could be satisfied with one type or size of a plough, or with one type and power of a tractor, and on the other hand in the technological process with the aim to obtain, for example, 50 mtc. per acre what required considerably deeper ploughnig, ploughs and tractors of quite different types and powers had been demanded. Till five or six years ago the demand for thrashers was enormous. By introducing combines, which reduced wasting to a very small amount (a the same time they performe both the harvest and the thrasing on the remarkably bigger pieces of land than the biggest thrasher coult perform the mere harvest) the demand for thrashers decreased in a terribly quick way.

8. All above quoted moments indicated the need of a very close coordination between the responsible institutions and industrial and agricultural organs. New decisions concerning the building of new capacities,about the aims and goals of their production etc., must have been the result of the coordination of the responsible authorities on one hand and agriculture and industry on the other. Besides that corresponding scientific institutions concerned with the problems of machanization of agriculture had to be organized. These institutions were obliged to perform investigations of new types of machines and to suggest attenstations on them. On the ground of their investigation of all factors on which the assortment of required machines depended (climate, relief, pedological structure of the soil, the structure of production, the structure and the size of a social collective farm, conditions of hands and sources of energy and so on) they were obliged to give their suggestions for the production to the industry. They also had to realise a close coordination with the constructive offices of industry. Concerning the problems of the development of agricultural equipement other aspects of very successful coordination between agriculture and industry was achieved. So for example the factories of agricultural machines took in their charge the organization of services for keeping in order and general repairing of their machines, starting to do it a few years ago. They also supply spare parts for their own machines. In certain cases the agricultural equipment industry takes care of the financement of various tests.

(a) Although regarding the above mentioned cooperation an enormous advancement was made, it cannot be said that everything is being settled without any difficulties. The problem of assortment and prices of agricultural machines is still unsolved. The industry of Yugoslavia though the demand of agricultural organizations were numerous,is not yet capable to produce quite a range of specific machines. The industry can turn upon producing such machines, too only when the demand attains a determined level, that is only when the production, considering the amounts of godds which can be placed at markets, can reach the bulk which is to make the production a profitable one.

9. Parallelly with the development of home agricultural machine industry, in the whole of post-war period Yugoslavia was importing agricultural machines. In the early post-war period, Yugoslavia imported machines mostly be-

cause the home production was scarce. Later on, when the home industry was also rather developed, our country stuck to import because the home production assortment was insufficient. We had sudden increasement of import as a rule in those years, namely in those periods, when the tempo of agricultural investments was considerably increased as well (1955 and 1957), and when some other conditions for attaining a quicker tempo of agricultural production development were most suitable. Expecially great import of agricultural machines was realized after 1957, when the production process was made more modern and when new forms of cooperation were applied between general cooperative farms and individual producers.

(a) Permanently struggling through difficulties in the balance of salaries, Yugoslavia was forced to import agricultural machines from various countries, and all that depended on circumstances and conditions in the period in which the import was made. The variety of brands and types of the one and same kind of agricultural machines as a result of import from many countries, had several disadvantages. First, as a rule, some of the spare parts were to be found nowhere, and the difficulties in replacing them were enormous. When, however, the means for payment were awarded and when the import of necessary parts was carried out, the trouble was how to distribute them (as one had to deal with small quantities) in order to get them to the very place at which they were very badly needed, and not by any means left in stock unused. Lacking some ot the spare parts, specially in full season, people used to take off some parts of a machine and put them on another. Hence so inumerable difficulties both in the regular keeping of a machine and in general repair of imported machines. Besides every new type of an agricultural machines requires a new training of men who will work upon them. Sometimes it was only due to insufficient training of workmen that various mishandling and defects happend. It was not a few times that the imported machines which were constructed for different climate conditions or for different relief of soil, or different structure of soil, etc., were left, after certain unsuccessful efforts to be put into work, unused, in stocks of shops, or at social collective farms or at cooperative farm premises.

10. Considering all the quoted experience and difficulties that sprang up in connection with imported equipment, the orientation towards own home production of the equipment largely used was confirmed to be justified. With specific equipment, on the contraty, (e.g. with equipment in cattle-breeding, as well as some equipment for plant production as long as the use of it becomes wide-spread, then certain kind of equipment for various processes for agricultural products, etc.) the expenses of production are to indicate whether it is better to import some of the kinds of the equipment or to manufacture them in the country. Whereas with production of equipment which is to be largely applied specific Yugoslav conditions ought to have been taken into consideration, so that the production had to stick to original home conditions or modified foreign licences, with specific equipment the production according to foreign licences, could be relied upon to a great extent.

11. The present state of agricultural equipment of Yugoslavia can be seen out of the data presented in the following table which shows the capacity of land according to sectors of proprietership on one side, and numerical state of some elementary machines according to their owners on the other:

	Measure units	Social sector		Individ. producers
		Soc.coll. farms	Gen. coop.farms 4)	
Ploughable areas	000 acr.	581	318	6,750
Tractors	comb.	15,536	16,712	3,239
Tractor sprayers of fertilizer	"	3,202	2,813	-
Tractor sowers	"	3,235x)	3,545x)	-
Combines	"	4,277	2,262	-
Lorries	"	840	1,122	-
Motor thrashers	"	772	5,645	15,807
Ploughsdrawn by teams	000	-	-	1,333
Reapers, grass-cutters and self-binders		4,875x)	6,527	47,211xx)

x) tractor
xx) drawn by teams

Table 2

4) General cooperative farms have their own economies which are nothing else but social collective farms. The machines belonging to general cooperative farms are used partly to cultivate the land of these economies, and partly to cultivate the areas of individual producers.

(a) The development of the equipment in agricultural tools and machines can be judged according to the data quoted here and before, for the period after the Second World War.

Big-sized agricultural machines and modern equipment in general were introduced and owned by social collective farms in the first place. With those farms 40 acres of ploughable land were ploughed by one tractor and one combine did the work at proximately 80 acres sown with corn (excepting maize). With those farms heavy tractors do about 20%, middle-sized tractors 70% and the light ones 10% of the work. Those farms have completely mechanized the whole process of producing wheat, and now they have gradually started mechanizing the process of producing sugar-beet, maize, some kinds of forage crops, etc., too. They are striving also to mechanize as much as possible the process of production of fruit culture, too, where plantages have been intensely raised and particularly in animal husbandry where are being introduced so-called "industrial" method of producing meat, for which, beside other installations, apparatus for automatic feeding and watering and taking out manure are being installed in pigsties.

(b) Individual households, too, are much better equipped with both quoted and not yet mentioned machines. They have all kind of apparatus and machines in a larger number than before the war. However, while judging the supply of machines belonging to individual households, especially in comparing the number of certain machines in pre-war period to that of post-war time, we should keep in mind the fact that the areas at their disposal is for 12-13% smaller than in pre-war period. Besides, one should bear in mind that compared to pre-war conditions, the quality of those machines is much improved. The machines are more modern now, better in quality and considering the aim they serve, they are much more appropriate.

(c) When machine equipment of individual economies is considered, one must keep in mind that a good deal of machine capacities belonging to social collective farms is also used for cultivating the land of these economies. At least one half, as it seems, of all tractors and tractor machines as well as almost all thrashers owned by these cooperatives in fact work upon the land of individual producers. The cooperatives have specially organized work-shops of their own, that is to say particularly organized economic units which dispose of the machines with which they cultivate the land in cooperation with individual producers or they help them with cultivating the fields. In order to reduce expenses, that is to make the prices of their services lower. The cooperatives often make agreements about offering services or about cooperation only in cases when individual producers do the sowing of a particular culture on a larger scale. Their agreements of offering services or of cooperation with individual producers are made under condition that the producers should apply such technology of production which vouches for considerably greater crops per acre than the ones acquired by the farmer some time ago. They, on the other hand, with the condition that the individual producer should deal with delivery of one of the production (cooperation) offer their services on credit or they give their producers an allowance in material (generally in fertilizer and in sorted seeds). The prices of the services done by cooperatives are always such as to protect their mutual interest - for the farmer to be offered a service and the cooperative to offer a service.

(d) Out of the quoted data it may be not clear, but it is a fact that a considerable number of small private economies is still unequipped with machines. This does not happen to be because the equipment is not available at our markets, or the prices are high (compared with prices of agricultural products), but because the owners of such economies (they themselves are employed in industry, or members of their families are), have no interest either in getting the machines or in agricultural production, or they find it more convenient to turn to cooperative mechanization. Finally, in some parts of our country there are hauseholds which still live on natural production. On such households as well as on many others, there is a lot of work done by hand and by hand-tools. In agriculture of Yugoslavia sickle, scythe, and hoe can still be found and you can see hoeing, sowing by hand, picking up grapes by hand etc.

12. Comparatively great influx of various kinds of equipment into Yugoslav agriculture did not work without difficulties, and complications. In the

post-war period different problems shaped themselves, but the most expressive were: question of the most convenient organizing form for using mechanization on a large scale, then the problem of training the necessary crew - tractor drivers, combine-drivers and mechanicians in agriculture, then the question of regular keeping in order and repairing of those machines which were used already, and finally the question of new type machines production which would fit better in newly created conditions.

(a) How the question of organizational form in which a total mechanization will be used was solved, was partly explained in the beginning. Namely, at first they were agricultural machine stations, and then, after they had been abolished, they were agricultural economies, producing and general cooperatives. As far as bigger economies and cooperatives were concerned, they had, as a rule, quite independent machine work-shops for repair and keeping of the machines. Economies and cooperatives were found to be more efficient in using their machines than machine stations themselves. Anyway, the scope and efficiency in using them were fully dependent on payment system. The more stimulative the system was, and the personal income of the workers depending on the achieved results, the better and more efficient the using of mechanization was.

(b) The problem of training the necessary crew for tractors and of training mechanicians in agriculture was a very sharp one, especially so in the first years. That is why the entitled organizations (as, for instence, Chambers of Agriculture, assossiations, cooperative unions, etc.) had those workers trained at courses and special schools. The problem grew even more difficult as the men trained in agriculture were apt very often to change their profession and a tractorist felt like turning into a driver, or, as far as mechaniciahs were concerned, they tried to get employed in industry or in other branches of economics in those branches offered them better conditions at the moment. Another difficulty was the very need (which in the early days of mechanization was not fully grasped) of having tractorists and mechanicians in agriculture trained not only in handling the machines but in dealing with all possible technological operations which they had to perform.

(c) The question of a regular keeping in order and repair of machines was often a serious one, if not quite critical. First, there were not enough men who could get engaged in that work, and, second, a spacy work-shop with corresponding equipment had not been built yet. Now, according to a special programme and with means out of investment funds, a large range of work-shops for various kinds of repairs was built. Some of those work-shops were built by agricultural machine factories. The existance of big commercial enterprises, which were in charge to supply the agriculture with all necessary equipment and with spare parts, was the chief factor which made the problem, concerning supplies, solvable.

13. A better equipment in agricultural machines in general, and a better equipment in modern agricultural machines in particular, enabled us to have the same areas, as we had before the war, sown in the whole, in spite of a considerable abandoning the villages on part of their inhabitants. On the other hand, a good supply of big machines made it possible to do the sowing on about 35% of areas (almost all the areas of social collective farms and those belonging to private owners but being cultivated in cooperation with other economies) applying other modern means for production, (fertilizers)[5], means for protection, high-quality sorts, etc., in other words, to apply such technological ways which fit in a highly intensive production. This, again, enabled the increase of crops per acre in agriculture as a whole, and in social collective farms and economies in particular.

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5) Total consumation of fertilizer was, before the war, only 46,673 t. (5,9 kg. per acr. of total plough. areas) that is in 1955 only 279,000 tons (36,1 kg. per acr. of total plough. areas) mounted to 1,198.000 tons (155,8 kg. per acr. of total plough. areas in 1960).

(a) The increase of crops showed itself as following:

	Agriculture, total		
	1935-39	1956-60	1960
Wheat	12,2	15,2	17,3
Maize	16,8	18,7	23,9
Sugar-beet	191	244	294

	Social collective farms		
	1954-55	1956-60	1960
Wheat	13	28,1	30,6
Maize	19,2	40,2	45,4
Sugar-beet	183	292	337

Table 3

Apart from their results being so good, social collective farms are not yet satisfied with the achieved crops and they are firm in working hard in order to attain a further increase.

(b) By introducing mechanization in agriculture of Yugoslavia,it could be possible to reduce the number of oxen in work compared to the pre-war situation from 1931 from 944,000 to 677,000 oxen in 1961. By reducing the number of horses and oxen at least 600 milion food units were spared, which were used for increase of milk and meat production. This item presents another indirect result in agricultural production which was achieved by a wider appliance of mechanization.

(c) The increase of equipment in agriculture, apart from economical results, has in Yugoslavia some other positive social-political consequences. Namely, by putting aside the means to invest them into mechanization and into other modern ways of production, the social community makes the development of economical relations more facilitated, specially between general cooperatives and private farmers' households, and this connection is performed through various forms of cooperation which enables a gradual introduction and enlargement of modern social process of production.

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ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
FOR THE BENEFIT OF THE LESS DEVELOPED AREAS

C O R R I G E N D U M

The contributor Government notifies the following correction:

Throughout this paper the word "hectare" is to be substituted for the word "acre".

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NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

2. Papers selected for inclusion in Specialized Sessions will be available at the Conference in only one of the above official languages.

3. Summaries of all papers, as submitted by contributors, will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

4. Papers and summaries will not be available for general distribution in advance of the Conference. They will be published in advance in limited quantities only for the use of delegations of participating governments and of other authorized participants. Post-Conference publication and general distribution of the Conference Proceedings will follow United Nations practices as laid down by the United Nations Publications Board.

THE DEVELOPMENT OF AGRICULTURAL EQUIPMENT

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Because of the insufficient equipment in tools and machines in the period before the Second World War, in Yugoslavia there was no basis for applying technology of production at the level applied in developed countries of Western Europe. It strongly affected the crops per acre.

But in early post-war period special attention was paid to mechanization of agriculture. Social community at the same time forced both the home production and the import of agricultural machines. It was done with the purpose to enable as intensively as possible the cultivation of areas belonging to social collective farms, and to help the individual producers who did not possess the machines of their own.

Building up of home industry was approached three reasons : first, because by developing home capacities for production of agricultural machines and by making the use of the more wide-spread in the development in agriculture in general, the effects can be much greater than by undertaking some other measures; second, because it was supposed that it would not be possible to have as much spare money as would be necessary for securing the means of payment; and third, it was kept in mind that for weather and other conditions in Yugoslavia it was much better to create corresponding types of machines.

As ploughs, harrows and similar smaller machines had been produced in the country before, the first phase in the further development of the domestic industry presented achieving the production of sowers, grass-cutters, reapers and other kinds of machines, and then achieving the production of motor-thrashers, too. Regarding the need for larger machines in connection with the changes in the structure of farms,which had become greater and greater,the following phase in the development of domestic industry represented the achieving production of tractors and machines combined with them,and finally in 1953 achievement of production of tractors, too.

In its development the industry of agricultural machines was compelled do keep in mind all changes in the structure of agricultural farms and as well in structure, technology and organization of production on these farms; and as well as a series of other changes which took place in the post-war development of the country. So a very close coordination between the responsible authorities and agricultural institutions and industry was extremely necessary. Besides that responsible institutions dealing with all problems of mechanizing the agriculture had to be established.

Parallelly with the development of home industry, during the whole post-war period Yugoslavia kept importing agricultural machines. In the first years of that period she imported them exclusively because of the products of home industry were insufficient. Later on, when home industry became quite developped, she kept importing them because the assortment of domestic industry was rather incomplete.

Continually struggling through difficulties in the salary balance, Yugoslavia was compelled to import agricultural machines from different countries. The variety of make and types what was the result of it, caused a number of disadvantages (lack of spare parts, difficulties in regular keeping and repairing, training of men).

Social collective farms were first to introduce large agricultural machines. They had completely mechanized the whole process of wheat production, and now they are striving to mechanize the processes of production of sugarbeet, maize, some kinds of forage plants, etc. They are striving to mechanize also as much as possible the processes of fruit production, particularly in animal husbandry, where, besides other installations, apparatus for automatic feeding and watering and mechanized preparing of food and taking out manure are being installed in pigsties.

Individual economies are also much better equipped with machines than before the war. Besides that, a great deal of machine capacities owned by social collective farms is used for cultivating the land of these economies. Collective farms have separately organized work-shops which offer their services to these economies.

A comparatively large influx of various equipment caused a lot of difficulties. Quite a number of problems appeared among which the most striking are: the question of the most convenient organizational form for using large machines, the problem of training the required crew for tractors, then the problem of regular keeping and repairing and, finally, the question of acquiring new types of machines.

A better equipment of machines enabled us to have the same areas, as we had before the war, cultivated in the whole, in spite of a considerable abandoning the villages on part of their inhabitants, and on about 35% of areas work is done by machines and other modern production equipment, that is to say in such technological procedures which are connected with a highly intensive production. This has enabled us to increase crops per acre in the whole agriculture and particularly on social collective farms, and to make some savings in animal food by decreasing the number of animals in work.

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NOTES

1. Les mémoires choisis pour être présentés en séance générale pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

2. Les mémoires choisis pour être présentés en séance spéciale pourront être obtenus à la Conférence dans l'une seulement de ces langues officielles.

3. Les résumés qui ont été rédigés pour tous les mémoires par les auteurs de ceux-ci pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

4. Préalablement à la Conférence, les mémoires et les résumés ne feront pas l'objet d'une distribution générale mais d'un tirage restreint destiné aux délégations des gouvernements et autres participants officiels. La publication et la distribution générale des actes de la Conférence s'effectueront conformément aux règles et pratiques agréées par le Comité des publications des Nations Unies.

ABATTAGE DU BOIS EN REPUBLIQUE POPULAIRE DE BULGARIE

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La superficie forestière en République populaire de Bulgarie s'élève à 3,704,000 hectares, ce qui représente 33% de tout le territoire du pays. La répartition de cette superficie en différentes espèces de forêts est comme suit: - conifères - 15%, latifoliées à hautes futaies - 48% et à basses futaies - 37%.

De la superficie des forêts conifères 51% revient au pin sylvestre (Pinus silvestris), 21% au pin noir (Pinus nigricans), 19% à l'épicéa (Picea excelsa), 5% au sapin (Abies alba) et 4% au pin blanc (Pinus peuce), au mélèze (Larix) et autres.

De la superficie des forêts latifoliées à hautes futaies 52% revient à l'hêtre (Fagus silvatica), 25% au chêne (Quercus) et 23% aux autres essences latifoliées.

Les forêts à hautes futaies sont surtout de chêne, de hêtre et de charme (Carpinus) .

La densité moyenne des peuplements conifères est de 0.64, des latifoliées à haute futaie - de 0,65 et de basse futaie - de 0,68, tandis que la réserve moyenne des peuplements latifoliés à haute futaie et conifères déjà mûrs est de 225 m^3 par hectare.

Les forêts sont concentrées surtout dans les régions montagneuses où prédominent les terrains abruptes. Leur répartition d'après l'altitude est approximativement la suivante:

Les forêts disposées sur des terrains atteignant une altitude de 250 mèt. représentent 18% de toute la superficie forestière, de 250 à 700 m d'altitude - 40% et de 700 à 2000 m - 42% .

Les méthodes d'exploitation de nos forêts sont conditionnées par leur caractère montagneux, ainsi que par l'important rôle de rétention de l'eau et de défense qu'elles jouent. Ainsi par exemple, l'exploitation industrielle des forêts est réalisée 70% par l'exécution de coupes successives et par trouées, 15% par coupe d'éclaircies et 15% par coupe rase (reconstruction des forêts de peu de valeur et à rendement inférieur)

Les différentes initiatives à l'échelle nationale visant le boisement, la sylviculture ou l'exploitation des forêts sont grandement facilitées par le fait que chez nous les forêts sont propriété nationale.

En règle générale la production annuelle bulgare (abattage, trafnage et transport) en bois d'oeuvre est d'environ 3,500,000 mètres cubes, dont 1,350,000 m^3 matériaux d'essences conifères, 150,000 m^3 de chêne et 2,000,000 m^3 des autres essences latifoliées, ainsi que 2,380 000 m^3 de bois de chauffage. Cependant, à part le bois, on obtient annuellement des forêts également environ 2,150,000 tonnes de résine balsamique, 10,000 tonnes d'écorce d'épicéa, 18,600 tonnes de copeaux de pin, 21,000 tonnes de char-

bon de bois, 4 100 tonnes d'écorces de chêne et 2 500 tonnes de sumac.

Le processus de l'abattage des bois comporte trois phases: 1) Coupe et traitement primitif des matériaux; 2) Exportation de ces matériaux depuis les parterres de coupe jusqu'aux stations des camions, et 3) Transport jusqu'aux entreprises travaillant le bois ou jusqu'aux stations de Chemin de fer.

1 - COUPE ET TRAITEMENT PRIMITIF

La coupe et le traitement primitif sont opérés par des groupes spécialement organisés - brigades d'abattage - qui sont équipés de tous les instruments et outils nécessaires - de scies à moteur, de scies passe-partout, de scies à arc, de haches, de chevilles etc. La composition des brigades varie de 5 à 8 personnes et dépend du peuplement où l'on opère l'abattage. Le processus se déroule comme suit: deux bûcherons effectuent la préparation de l'abattage - nettoyage du parterre de la coupe de bûchers, d'arbustes et autres, l'étaillage des pousses autour des troncs, choix de la direction de la chute, l'entaille et la coupe elle-même. L'étaille est effectuée avec une scie mécanique ou combinée avec la cognée et l'abattage avec la scie à moteur. Un ou deux couples de bûcherons sont occupés à débarasser manuellement ou mécaniquement les troncs abattus des branches et des ramilles, à obtenir les différents assortiments et à enlever l'écorce des matériaux conifères. Un ouvrier est chargé de ranger les bois et ramasser en tas les débris de la coupe et les branchages. Le tronçonnage de l'arbre en assortiments est l'opération la plus importante de la coupe et, pour cette raison, est confiée au bûcheron le plus expérimenté, qui est le brigadier du groupe. Sa tâche consiste à obtenir les assortiments les les plus utiles pour l'économie nationale sans aucun gâchage des matériaux. En Bulgarie le bois est utilisé pleinement, indépendamment de ses dimensions. Depuis quelques années on obtient un nouveau assortiment di "Matériaux pour des travaux artisanaux", que l'on distrait de la masse du bois de chauffage et sont destinés à la production de matériaux d'emballage, des lames de parquet, des douves pour tonneaux, etc. Pour tout le pays la quantité des matériaux pour travaux artisanaux est d'environ 700,000 m^3 par an, ce qui représente près de 30% de la masse du bois de chauffage.

Dans un parterre de coupe travaillent à la fois un, deux ou plusieurs groupes de bûcherons selon le volume de la masse à abattre et le délai imparti pour cet abattage. Pour chaque parterre de coupe on dresse préalablement un schéma technologique détaillé pour le processus de la coupe, la répartition des groupes et la façon d'exporter .

Depuis quelque temps on pratique une nouvelle technologie de l'abattage - coupe de troncs tout entiers et de longues sections de troncs. Avec cette méthode de travail on n'effectue dans le parterre de coupe que l'abattage des arbres en les débarassant des branches et des ramilles, le tronçonnage partiel étant fait uniquement pour les gros tronc. Ainsi les opération de tronçonnage et de triage des assortiments ne sont plus faits dans les conditions difficiles du parterre d'abattage mais dans les entrepôts provisoires ou dans les stations de chargement des téléphériques. Les avantages de cette technologie sont : l'accroissement de la productivité du travail de 4 - 5%, ainsi que l'accroissement du rendement en bois de construction de 5 - 6% au détriment du bois de chauffage.

La mécanisation de la coupe, du débarassement des branches et du tronçonnage est opérée à l'aide de scies légères à moteurs à essence dirigées par un seul ouvrier (Fig.I et II). Une telle scie mécanique arrive à abattre annuellement environ 2500 m^3 de bois et remplace le travail de deux bûcherons. Le tableau ci-

dessus indique la croissance de l'abattage mécanisé chez nous:

Années	1952	1959	1961	1962
Nombre de scies à moteur	60	493	1600	2000
Matériaux abattus	3736000	5012000	6380000	6230000
Matériaux coupés avec des scies à moteur	80000	1704000	2745000	4950000
% de l'abattage mécanisé	2,13	34	43	80

Note: Les chiffres pour l'année 1962 sont en perspective .

La tendance est que jusqu'à 1965 l'abattage soit mécanisé à 100% ce qui allégera grandement le pénible travail des bûcherons.

2 - L'EXPORTATION DES MATERIAUX DEPUIS LES PARTERRES D'ABATTAGE JUSQU'AUX STATIONS DES CAMIONS (Les entrepôts provisoire)

Le proche transport des matériaux depuis les parterres d'abattage jusqu'aux stations des camions dépendent de la densité du réseau routier et des conditions du terrain. En République populaire de Bulgarie on compte pour chaque hectare de superficie forestière 7,15 mètres linéaires de routes du réseau forestier, dont 3.6 m.lin. de routes automobiles, 3.5 m.lin.de routes de chariot (de traînage) et 0.04 m.lin. de routes à rails. La densité du réseau routier forestier s'accroît sans cesse, vu que chaque année on construit 60 km de nouvelles routes macadamisées, 500 km de routes non macadamisées et 400 km de routes de chariot. Les plans et l'exécution des routes non macadamisées et de chariot sont l'oeuvre des exploitations forestières, tandis que les plans des routes automobiles sont dressés par une organisation spéciale "Agrolesproekt". Leur construction est effectuée par une autre Organisation d'Etat.

Dans les conditions des terrains forestiers abrupts et dans le cadre de la densité susmentionnée des routes du réseau forestier, le proche transport est effectué par un des moyens suivants: exportation (ou traînage) par force motrice animale, par téléphérage ou par tracteurs.

a - Traînage par force motrice animale

Actuellement la plus grande partie des matériaux - environ 60% - sont traînés par force motrice animale. Ce transport est effectué par des groupes spécialement organisés et pourvus du bétail nécessaire (principalement des boeufs, de chevaux ou des mulets), de chaînes, de chariots et autres ustensiles. Le processus du transport est le suivant : les matériaux abattus sont chargés sur les chariots et fixés avec des chaînes spéciales de fixage. Si le terrain est très abrupt et ne permet pas l'accès du chariot, on laisse choir manuellement les matériaux sur la pente jusqu'à un endroit plus commode pour le chargement, après quoi le matériel est véhiculé par les animaux jusqu'à la station des camions. Pour une distance moyenne de 1,3 km on obtient avec une paire d'animaux une production journalière de 3.2 m³ .

b - Transport par téléphérage

L'utilisation des téléphériques pour le transport du bois date de 1949, lorsque les deux premiers téléphériques furent construits. Depuis lors leur nombre n'a fait que croître pour atteindre cette année le chiffre de 282 différents systèmes de câbles téléphériques forestiers (fig. III,IV et V), que l'on fabrique en Bulgarie. Le processus du transport avec le téléphérique se déroule comme suit : Les matériaux sont exportés par des animaux

depuis les parterres d'abattage jusqu'aux stations de chargement. Ce sont des endroits déterminés d'avance par les tracés des câbles, et destinés à entreposer les matériaux. Les chargements y sont préparés et hissés à l'aide d'un treuil jusqu'au wagonnet transporteur, qui fait descendre par gravitation le chargement jusqu'à la station d'en bas. Après sa libération du chargement le wagonnet reprend le chemin de retour vers le haut, tiré par le treuil. On travaille ainsi lorsqu' il s'agit de faire descendre des matériaux des hauteurs de la montagne jusqu'aux chemins automobiles. Il arrive, cependant, qu'on soit obligé de retirer les matériaux depuis les ravins jusqu'aux stations des camions. Dans ces cas on procède inversement - le wagonnet vide descend par gravitation et les matériaux sont retirés à l'aide du treuil. Un tel téléphérique est desservi par 6 personnes - un conducteur du moteur, un adjoint conducteur, deux chargeurs et deux déchargeurs - et sa productivité annuelle est de 10,000 m³ de matière compacte. Il y a des groupes qui arrivent à faire descendre par le téléphérique de 12,000 à 13,000 m³ par an.

Dans certains endroits le téléphérique ne sert qu'à retirer les matériaux du parterre de coupe et les amasser à une distance de 50-60 mètres à côté du tracé. Dans ces cas, malgré la baisse sensible de la productivité du travail, l'effet économique est très grand à cause de la suppression du transport animal, qui est très cher .

L' usage du téléphérique à gravitation, dont le tracé comporte également des pentes inverses, se généralise de plus en plus. Ces téléphériques sont utilisés dans les endroits où les matériaux gravitent vers une station de chargement. La longueur utile du câble est illimitée. De ce type on a construit en Bulgarie aussi des téléphériques comportant des dévoiements horizontaux.

Les projets pour la construction des téléphériques sont établis par des spécialistes, qui ont le soin de choisir des tracés où le transport animal soit supprimé entièrement ou, si cela s'avérait impossible, le réduire à des distances ne dépassant pas 300 à 500 mètres lin. Pour obtenir ce résultat, très souvent les téléphériques sont établis l'un sur l'autre, dont l'un est principal et l'autre - sous-alimenteur.

L'établissement d'un tracé de téléphérique doit être conformé au devis de son effet économique.

Le montage des téléphériques est effectué par des groupes spécialisés et dure de 15 à 20 jours. Ces groupes disposent de tous les instruments et équipement nécessaires.

c - Transport par tracteurs

Ce mode de transport du bois n'est pas très répandu, son utilisation étant motivée par les différentes sortes d'abattage que l'on pratique dans nos forêts. Actuellement à ce genre de transport sont affectés 30 tracteurs à chenilles (fig. VI) . Leur chargement de 5 à 6 m³ est préparé d'avance et chargé à l'aide d'un treuil spécial. Le déchargement est également mécanisé.

Selon les conditions de travail, les tracteurs exportent les matériaux soit depuis les parterres d'abattage jusqu'aux stations des camions, soit jusqu'aux stations de chargements des téléphériques.

Le personnel désservant se compose d'un tractoriste et d'un aide-tractoriste et atteint une production de 15 m³ pour une distance d'un kilomètre. Un tracteur remplace 5 paires de bétail de somme.

Depuis 1961 on utilise pour les transports de courte distance 25 voitures automobiles spéciales circulant sur tous terrains (fig. VII) . Avec ces voitures on obtient une très haute productivité lorsque les distances sont de 5 à 10 km .

Avec les moyens techniques, dont on dispose - téléphériques tracteurs et automobiles - l'exportation des matériaux depuis les parterres d'abattage jusqu'aux stations des camions est mécanisée à 40% .

3 - LE TRANSPORT DES MATERIAUX

Le transport lointain ou le transport des matériaux depuis les stations des camions jusqu'aux entreprises de l'industrie du bois ou les stations de Chemin de fer est assuré par des automobiles poids lourds, sa mécanisation étant de 100%. Ces camions appartiennent à une autre organisation d'Etat.

Le processus de production s'opère de la façon suivante : les matériaux transportés jusqu'aux stations des camions sont triés et rangés par assortiments et par essences de bois. Leur chargement sur les camions est à 95% manuel. Pour rendre plus rapide le chargement et pour alléger la tâche des chargeurs, les exploitations forestières construisent des débarcadères spéciaux. Le chargement mécanisé s'effectue avec des grues mobiles d'une capacité de 3 tonnes.

Depuis quelques années on applique aux travaux d'abattage l'organisation complexe du travail. Elle se caractérise par l'établissement d'une union plus étroite entre les différents chaînons de production, comme, par exemple, entre les bûcherons et les transporteurs, entre les travailleurs des téléphériques et les chargeurs des camions ou autres, de façon à assurer un débit ininterrompu de la production. Ainsi on évite que les matériaux demeurent trop longtemps dans les parterres d'abattage ou les stations des camions et on accroît la productivité du travail de 12 à 16% .

En Bulgarie le processus de l'abattage du bois continue durant toute l'année. L'abattage, le transport et le chargement des matériaux sont assurés par des ouvriers permanents et temporaires. Tous les ouvriers font l'objet de soins spéciaux de la part des exploitations forestières.

Sans compter les machines, les instruments et tous les outils destinés à leur faciliter la tâche, les ouvriers forestiers bénéficient de plusieurs autres avantages; ils reçoivent gratuitement des vêtements d'été et d'hiver; leurs dortoirs sont confortablement aménagés et situés près des chantiers de travail, où ils disposent de cantines et de cuisines leur assurant une nourriture saine et bon marché.

Le voyage des ouvriers entre les chantiers de travail et leurs domiciles est assuré par les automobiles de l'exploitation forestière contre l'acquittement de 20% des frais.

Le rehaussement de la qualification des ouvriers fait l'objet de soins constants. A cet effet on organise des cours et des rencontres d'échange d'expérience, auxquels les ouvriers assistent en quittant ou en ne quittant pas leur travail. Pour les ouvriers mécaniciens sont organisés des cours d'une année, où ils apprennent à travailler avec les machines qu'on utilise dans l'abattage du bois. Au cours de leurs études les ouvriers reçoivent gratuitement logement et nourriture, ainsi que 90% de la rémunération de leur travail.

L'entretien et les réparations des machines sont pour le compte des exploitations forestières, et sont assurés par des ateliers de réparation spécialement organisés.

La rémunération du travail de l'abattage du bois est conforme aux normes et aux tarifs unifiés de l'économie forestière, élaborés par la voie de l'établissement des normes scientifico-techniques du travail, sur la base d'un guide de tarification et de qualification .

Fig. 1. Abattage mécanisé à l'aide d'une scie mécanique à moteur à essence

Fig. 2. Tronçonnage mécanisé d'un tronc

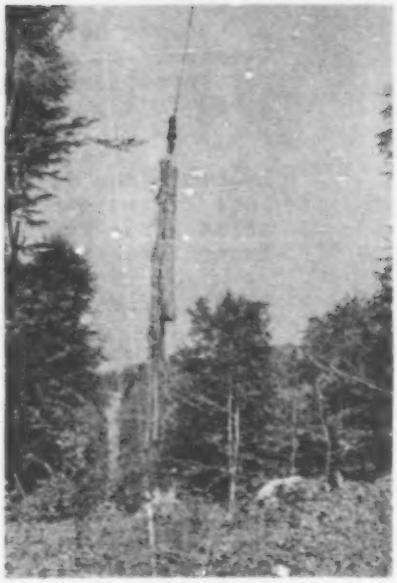

Fig. 3. Travail avec téléphérique transportable à cable unique

Fig. 4. Transport combiné par tracteur et téléphérage

Fig. 5. Travail par téléphérique à gravitation

Fig. 6. Travail par tracteur à chenilles

Fig. 7. Camions auto-chargeurs tous-terrains à trois essieux

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ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
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LOGGING IN THE PEOPLE'S REPUBLIC OF BULGARIA

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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

NOTES

1. Papers selected for inclusion in General Sessions will be available at the Conference in the following official languages of the United Nations: English, French, Russian and Spanish.

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LOGGING IN THE PEOPLE'S REPUBLIC OF BULGARIA

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SUMMARY.

The forest land in the People's Republic of Bulgaria amounts to 3,704,000 hectares, about 33% of its territory. It is subdivided by type of forest as follows: coniferous - 15%, broadleaf, highstem - 48%, broadleaf, small size - 37%.

The forests occupy mainly the mountainous regions of the country with prevailing steep slopes. The methods of management of the forests in this country are determined by the mountainous character of our forests and by their important water preserving and protecting functions. For example the industrial use of forests is carried out by progressive and patch fellings - 70%, regulating and hygienic fellings - 15%, and by clear fellings - 15% (for reconstruction of low-production stands).

The unification of all measures concerning logging in the whole country is facilitated by the circumstance that all forests are in public ownership.

In this country each year are logged 3,500,000 cu.m. timber and 2,380,000 cu.m. firewood. Beside this from the forests are obtained about 2150 tons of turpentine resin, 10,000 tons spruce bark, 18,600 tons of splinters, 21,000 tons of charcoal, 4,100 tons of oak bark, and 2,500 tons of sumach.

The logging is carried out in three processes: (a) felling and preliminary dressing of the logs; (b) skidding of the materials cut to the truck loading station; and (c) transport of the logs to the saw mills or railway stations.

A. CUTTING AND DRESSING

The felling is done by felling brigades equipped with all necessary tools and appliances: power saws, hand saws, axes, wedges, and the like. The brigades consist of 5 to 8 men, depending on the stand of the felling site. The felling and the cross cutting of the logs, as well as the removal of the main branches is mechanized. In this process the most important operation is the cross cutting of the logs in the best profitable lengths in order to ensure the production of most valuable timber assortments. The responsibility for this operation is born by the leader of the brigade.

The logging is carried out after a special technical schedule.

Nowadays a new logging technique is applied consisting in transfer of most cross cutting operations to the landings, where the conditions of work are more favourable. The introduction of this technique has raised the labour productivity by 4-5% and increased the production of timber by 5-6% at the expense of the firewood.

The felling is done by means of power saws of light type. This process is mechanized to 80% and it is expected to achieve full mechanization in the next few years.

B. SKIDDING OF THE LOGS FROM FELLING SITES TO THE LANDINGS

Owing to the steep terrains and the poor density of the forest transport network (7.15 running meters to the hectare of woodland) the skidding of the logs is effected by one of the following three methods: by draught animals, by overhead cable lines and tractor haulage. In the whole country about 60% of all logging is carried out by means of draught animals, the remaining 40% being mechanized.

The mechanized logging is effected with the aid of 282 cable lines of different types, 30 caterpillar tractors and 25 special cross country trucks.

The cable lines show best economical results when they are able to seize loads dispersed on the both sides of their route.

One cable line, operated by 6 men, is able to handle 10,000 cu.m. of forest loads yearly.

One caterpillar tractor operated by two men has a daily capacity of 15 cu.m. at a distance of 1 km and spares five pairs of animals.

The cable lines are planned by experienced specialists which work out at the same time the necessary technical specification and economic substantiation.

The mounting of the cable lines is carried out by special brigades in short terms of 15-20 days.

C. LONG-DISTANCE TRANSPORT OF LOGS

This transport is fully mechanized by means of trucks. The loading only is made in most cases manually and is facilitated by ramps erected on the loading stations. Only 5% of the loading operations are mechanized by means of 3-ton trucks.

The complex organization of the labour in the forestries introduced some time ago raises the labour productivity by 12-16% and prevents undue long lying of the materials on the felling sites and the truck loading stations.

The logging is carried out all the year around by permanent and temporary workers. The Forestry Boards take special care of their workers supplying them free with equipment, tools, working clothes, etc. They are housed in dormitories and catered for in canteens.

Much attention is devoted to the improvement of their professional skill, by training courses and meetings for pooling experience.

The workers are paid according to the common rates for forestry workers, established by a state table of remuneration for labour.

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